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BIRTH SELECTION *versus* BIRTH CONTROL

By Professor HENRY FAIRFIELD OSBORN

HONORARY VICE PRESIDENT, THIRD INTERNATIONAL CONGRESS OF EUGENICS

THIS International Congress is singularly opportune. It is not merely an academic problem we are met to discuss, or a problem of the future. It is not a theory but a condition which confronts us. It is a problem of the immediate present, and, like all sociological problems, the more fascinating because of its very complications. Man does not rise to his best endeavor in face of small problems; it is in the genius of modern humanity to meet and attempt to solve the most difficult. Eugenics is not a human invention by Francis Galton or any of his predecessors or successors. It is a long-known and universal natural law, namely, the survival of the fittest and the elimination of the unfittest.

It has always required a cataclysm to force a natural law upon the attention of man. Cataclysmic plagues of malaria, of typhus, of yellow fever, of tuberculosis, of cancer, forced upon human genius the imminent crisis of discovery, of palliation, of prevention, of cure. So in this world cataclysm of overpopulation, of over-multiplication of the unfit and unintelligent, of the reign of terror of the criminal, of the tragedy of unemployment, eugenics ceases to be the cult of the few pioneers like Galton and Leonard Darwin; it is forced upon our attention. Once more man is humbled because he is suffering from prolonged ignorance or actual defiance of and transgression of the most central and fundamental of all natural laws.

Prisons, reformatories, asylums, great public financial offerings, great national and local appropriations, great tides of human kindness and generosity, are merely palliatives and temporary expedients. They may for a time gloss over the cataclysm; they can not

[1] Address at the opening session of the Third International Congress of Eugenics, New York, August 22, 1932. Passages from this address were printed in the August *Forum* and are used here with the permission of the editor.

permanently cure it or avoid its recurrence. *The only permanent remedy is the improvement and uplift of the character of the human race through prolonged and intelligent and humane birth selection aided by humane birth control.* This is the burden of my address; it is the keynote of our third congress.

I by no means profess to be an expert eugenist. I think, I write, I speak, rather as a trained and experienced observer of animal and of human evolution, and I bring to bear upon this problem my own original researches and observations on the intelligence and behavior of man. In lucid intervals between other more immediately pressing researches, I have been directly or indirectly studying human evolution, individual, racial and creative, since the year 1880.

Within the present year, however, my thoughts have been forced to take an entirely new trend, namely, the bearing upon human evolution and human progress of the present wholly unanticipated conditions of human life and environment subsequent to the world war. I am deeply impressed with the practical unity of all world problems—sociological, economic, educational and religious. My world tour began in the Polynesian and Melanesian islands, where certain isolated communities are to be found still untouched or unmarred by civilization, with all primitive human activities still in force among the once superb and self-sufficient races of the South Sea and Cannibal Islands, such as Fiji, New Caledonia, New Guinea.

The pristine isolation which enabled every country to pursue its own evolution independently of all other countries, in Japan before Perry's advent, in Korea before Japan's conquest—an isolation still sharply exemplified in the greater part of China—is all a condition of the past now submerged or even banished by commercial invasion, by military conquest, by the far more potent forces of modern inventions which unify once remote and isolated countries and bring them, whether they will or no, within the barbaric or civilizing influences of the entire modern world.

In Java I first perceived the disturbing influence of the introduction of machinery and mass production on the old uncivilized economic order. While checked by introduced diseases in the South Sea Islands, the Javanese population is mounting with alarming rapidity, having jumped from 12,000,000 to 40,000,000 in an incredibly short space of time, a naturally fertile race being protected from disease and multiplying under their original mating customs. But even in these countries, relatively immune from the dangers of civilization, we begin to observe the initial effects of world interaction.

The outstanding generalizations of my world tour are what may be summed up as the "six overs"; these "six overs" are, in the genetic order of cause and effect:

Over-destruction of natural resources, now actually world-wide;

Over-mechanization, in the substitution of the machine for animal and human labor, rapidly becoming world-wide;

Over-construction of warehouses, ships, railroads, wharves and other means of transport, replacing primitive transportation;

Over-production both of the food and of the mechanical wants of mankind, chiefly during the post-war speculative period;

Over-confidence in future demand and supply, resulting in the too rapid extension of natural resources both in food and in mechanical equipment;

Over-population beyond the land areas, or the capacity of the natural and scientific resources of the world, with consequent permanent unemployment of the least fitted.

Added to these "six overs" in many but not in all countries, there have been over-speculation and a consequent over-capitalization that have placed on individuals and communities and intolerable burden of debt which at the present outlook there are few means to repay. Every port I visited revealed over-population, over-production and unemployment—whether in the South Seas or in the great cities of Europe and America. Everywhere ports were full of empty vessels. Everywhere the number of employees in all grades was being cut down, and everywhere the world's staples, even rice, stood about in quantities far exceeding the world's demand.

Certainly the fears of the great physicist Sir William Crookes, a contemporary of Francis Galton, have not been realized that a time would be reached when the feeding of the rapidly increasing population of the world would be a problem of the first economic importance for which he suggested such a remedy as harnessing Niagara Falls in order to secure an adequate amount of nitrogen for the reinvigoration of depleted soils. On the contrary, modern agricultural science and invention have more than met these apparently insuperable dangers besetting certain over-populated countries, such as Java, with a superabundant rice supply even for its teeming 40,000,000—rice being produced so cheaply that it is not commercially profitable to sell it—just as wheat is being produced in America so cheaply that we have an over-supply of wheat for our 112,000,000 people. Java's over-population, therefore, can still be fed. But the taking up of every acre of land, even to the mountain tops, has not solved the overcrowding problem of Java, as evidenced by her endeavor to export her surplus of people to other less populated islands.

With this prologue let us for the moment concentrate on several of the outstanding social conditions

of the day and hour, namely, overpopulation and unemployment. Is overpopulation a reality? Is unemployment a temporary or a permanent condition? Is birth control the best means of checking overpopulation, or is birth selection aided by birth control the better means? We shall consider overpopulation from the double standpoint of birth selection and of birth control. Even the lives sacrificed in the world war, apart from the ethical and intellectual problems of human advancement, are entirely negligible compared with the natural increase of mankind when no longer checked by disease, by infant mortality and by internecine wars. The International Statistical Institute estimates that the world added 125,550,000 to its total population in the years 1920–1928.

DISTINCTION BETWEEN BIRTH CONTROL AND BIRTH SELECTION

First, let us clearly distinguish between birth selection and birth control.

Birth selection is the cardinal principle of the whole eugenic movement as first propounded by the great biologist Francis Galton and defined in 1884 as follows: "Eugenics is the study of agencies under social control which may improve or impair the racial qualities of future generations either physically or mentally." Birth selection is directly in the order of the Darwin-Spencer law of the survival of the fittest. Birth selection is known as "positive" eugenics, of which eugenically administered birth control should be only a subsidiary "negative" principle. As conceived by Galton it is an ameliorative, curative and positive force in the advancement of mankind and the uplifting of society as a whole by improving human quality as distinguished from quantity. It aids and encourages the survival and multiplication of the fittest; indirectly, it would check and discourage the multiplication of the unfittest. As to the latter, in the United States alone it is widely recognized that there are millions of people who are acting as dragnets or sheet-anchors on the progress of the ship of state. Some radicals propose that they should all be sterilized so as to inhibit the multiplication of their kind. This would be the negative or birth control method of birth selection.

Birth control, primarily designed to prevent the overpopulation of the unfittest or dysgenic, may prove to be a two-edged sword eliminating alike the fittest and the unfittest. Whatever its benefits in limiting the unfittest, birth control is always in danger still more of limiting the fittest and thus becoming positively dysgenic or against the interests of the race as a whole in which it is practiced. I have in mind the French, among whom birth control has been practiced in the upper classes for centuries, with disastrous racial results. My doubts about the present propaganda and purpose of the birth control movement are that they are so largely negative and death-dealing rather than positive and birth-encouraging. Only by some wise and selective means of limiting the number of births can the world find a solution for its disturbed economics. I return from a tour around the world more impressed than ever with the principle of "not more but better and finer representatives of every race." I hold that true for America as well as for foreign stocks.

For the time at least, I am very doubtful about birth control. In fact, on eugenic as well as on evolutionary lines I am strongly opposed to many directions which the birth control movement is taking, chiefly because I believe them to be fundamentally unnatural and hence destined sooner or later to fail of their original more or less benevolent purposes.

Finally, it must be clearly understood that we eugenists are chiefly concerned with birth selection measures which go to improve the general physical, moral and intellectual qualities of mankind, while measures which are designed to serve personal, individual ends and more or less temporary social demands are outside our province. Positive eugenics strives to improve racial quality on the one hand by *increasing* breeding and offspring among the eugenic element, and on the other negative eugenics by *diminishing* breeding and offspring among the dysgenic element. The eugenic element of the population includes that portion which is able to exert the greater amount of physical and mental energy, by so doing the better to pull its own weight in the social group, and through a superior moral, temperamental and intellectual endowment to make the greater contribution to the understanding of human life conditions, to cultural progress and to general racial improvement. It would be a mistake, however, to regard this element as confined to a narrow class of intellectual superiority, fully granting this class to be highly essential. Many diverse abilities and aptitudes are required for the consistent and balanced development of humanity. In short, the eugenic element of the population may be defined as that portion of existent humanity which is competent to produce the best resultant evolution of the species.

IS THE WORLD OVERPOPULATED?

Two high authorities in the anthropological world differ widely on the question whether or not the world is overpopulated. From my recent voyage around the world and observations in many lands I have reached the opinion that overpopulation and underemployment may be regarded as twin sisters. From this point of view I find that even the United States is

overpopulated at the present time. Dr. Louis I. Dublin, third vice-president of the Metropolitan Life Insurance Company and an experienced statistician, takes a different view as regards the United States when he says: "As to the United States, I can not see that from any standpoint whatever we can regard our own country as being over-populated. Our exports exceed our imports and we are quite able to feed and house our present population and many more that may be born or come in from abroad in later years." Dr. Dublin does not agree with me as to either the pressing danger or the best preventives of overpopulation. He writes (June 6, 1932):

I have not been greatly impressed with the warnings of certain writers that the world is suffering from overpopulation. When East's "Mankind at the Crossroads" appeared and made such a stir, I wrote a review in which I took issue with his views. Wiggam and quite a number of the men associated with the eugenic movement have aired much the same views as East and their almost uniform suggestion has been to spread birth control knowledge throughout the world and, in this way, avert the calamity of over-population and worldwide misery, which was otherwise inevitable.

Apart from a few countries such as China and India, possibly Japan, there is no evidence of overpopulation, certainly not of serious overpopulation at the present time, because never before in the history of the world has there been so much food available and so much of other necessities of life. The reason that many people now are ill-fed and otherwise destitute is not that there are too many people, but that our systems of distribution and of consumption have broken down. Or to put it another way, it would not help the present economic or social situation one bit if by some hocus pocus the population could be uniformly reduced 50 per cent. I make this point because it is implied in the whole theory of overpopulation. Those who have such views forget that people are producers as well as consumers. The crux of the problem is not the absolute number of people but rather the relation of the numbers of the people to the necessities available to them through our existing channels of commerce.

China and India are, as I have said, overpopulated. My test is the low standard of life in those two countries. The people are immeasurably worse off than are the people of Europe or of America. Yet, it is of great interest to find that unemployment is not a problem in those two countries. The masses are employed but their industry is so unorganized, their channels of transport and distribution are so primitive, that there is a very meager existence possible for the people.

It is in a country like ours or in industrial Europe that we suffer from unemployment. But here again, I am not at all sure that such unemployment is closely related to overpopulation. We in the United States are certainly not overpopulated by any test that I know. England and Germany would be overpopulated if they depended on themselves for their food supply. But those two countries have launched on another program. They are highly industrialized and exchange their surplus products for food. Ordinarily, they have got along very well. The present crisis in which they and we and the rest of the world are plunged is not the result of overpopulation. It is rather the result of disorganization and of a number of causes, some of which you have very clearly specified in your category of "overs."

I do not agree with Dublin as to the population in the United States, for I think the present unemployment figures represent a condition likely to be in part permanent. A recent unemployment estimate, revised by Dr. Dublin on July 30, is as follows:

Germany	5,500,000
France	1,000,000
United States	10,000,000
England	4,000,000
Total	20,500,000

While some highly competent people are unemployed, the mass of unemployment is among the less competent, because in every activity it is the less competent who are first selected for suspension while the few highly competent people are retained because they are still indispensable. In nature these less-fitted individuals would gradually disappear, but in civilization we are keeping them in the community in the hopes that in brighter days they may all find employment. This is only another instance of humane civilization going directly against the order of nature and encouraging the survival of the unfittest.

Recent World Population Figures

1927	Dutch East Indies, total		51,882,842
	Dutch Java		41,719,524
1921	British Possessions:		
	Asia (1921)		364,646,807
	Africa (1921, 1928, 1925)		46,948,380
	America (1921)		11,149,110
	Australia (1921, 1926)		7,886,217
	Europe (1931)		46,216,099
			476,846,613
	American Philippine Islands		12,082,366
1928	Europe		478,114,000
	North and South America		238,332,000
	Africa		140,269,000
	Asia		1,070,483,000
	China	474,000,000	
	Japan	69,336,000	
	Korea	21,058,000	
	Oceania		9,369,000

Rights and Wrongs of Birth Control

In civilized countries the birth control people are on strong theoretic but not practical grounds as regards the mechanical prevention of overpopulation,

but in half-civilized or uncivilized countries their principles have already been anticipated by more or less barbaric, cruel or inhuman measures, such as the control customs of the Australians, or the killing of female children by the Chinese.

Birth control has become a national and in a measure an international movement. The country which has birth control in its most radical form is Russia, where it is said to be connected with a great deal of sexual promiscuity. There the State is coming to the aid of young women with whom contraceptive methods have miscarried. Birth control has been welcomed by radicalism in several countries, especially in England, as an opening means whereby the two sexes will be placed on the same level of sexual freedom. One eminent American eugenist who attended the birth control congress in London last year, although a medical man accustomed to looking such matters in the face, was so shocked by what he heard and saw that he retired on the second day, and has since written a very able paper against birth control as now practiced. While not materially affecting the more ignorant and less desirable classes, he found birth control diminishing births among superior individuals and families. Let us therefore consider birth control as one of the more or less radical departures from fundamental principles of our present social structure not only in the religious but in the ethical and moral fields. More or less sincere advocates of contraception claim that it is one of the greatest social discoveries ever made by man, an ideal method of controlling overpopulation, a promising agency of social regeneration, and that it goes further than any previous social measure in the emancipation of womankind.[2]

Directly bearing upon the purposes of the present Eugenics Congress is the claim that contraception is wholly eugenic. A considerable section of the public has thereby been persuaded that contraception and eugenics are identical and that in general birth control has a eugenic endorsement. The fact that the subject of birth control was not admitted to the two previous International Congresses on the ground that it had not yet met the full tests of scientific inquiry is sufficient answer to the most extravagant of these claims. The fact that birth control is being indirectly considered in the present International Eugenics Congress embodies the admission that eugenists must now take their part in more or less world-wide inquiry and inductive testing of claims which thus far have been largely theoretical or hypothetical.

[2] This paragraph, and parts of the succeeding discussion, are quoted or expanded from a paper by Dr. C. G. Campbell, "'Birth Control' and Its Implications," published in altered form as "The Bio-Social Implications of Contraception," Proceedings of the 2nd International Congress for Sex Research, 1930.

As regards the limiting of population in the overcrowded communities of Europe the birth control propagandists advocate contraception on the one hand as indirectly eugenic by the reduction of offspring among the undesirable element. According to Dr. Louis I. Dublin, this need not apply to the United States. As quoted by Campbell, Dublin "has lately made a most thorough and painstaking estimate of population trends in the United States, and, not allowing for the further success of contraceptionists, he reaches the conclusion that the birth rate and the death rate will become equal in the United States in about thirty years, after which the population will not increase. This should quiet the fears of the neo-Malthusians, and at the same time it negates the contention that the general practice of contraception is mandatory on account of the danger of over-population." Campbell is disposed to "credit Dr. Dublin's forecast, partly because the largest life insurance company in the world depends upon him to calculate its vital statistics, and even more because his calculations have proven correct in other instances." Campbell further observes, "the population problem, in the United States at least, can be seen to be far more one of quality than of quantity. And if we seek to improve racial quality by the *restriction* of births, especially if such restriction seemed urgent, it should be evident that sterilization is a far more effective and dependable means of accomplishing this purpose than contraception. Hence contraception needs to find justification for itself other than on its eugenic value."

To promote the practice of contraception the birth-control propagandists claim to be benefactors of womankind whose great object is to relieve women of unnecessary suffering and unnecessary burdens. The attempt to relieve womankind of what may be termed the prehistoric and historic burden of the female of the species naturally enlists the sympathy both of the individualists of our time, who are ready to support any measure to give women greater freedom of profession and of action, and of the sentimentalists, who do not realize that women's share in the hard struggle for the existence of the race is a very essential element in the advance of womankind. The relief of the struggle for existence pressure from any animal or plant organism is an extremely dangerous experiment, for it may be said without exaggeration that the struggle for existence is the *sine qua non* of every great human or animal quality. Campbell recalls the fact that "the continuance of the race and the quality of the race rests primarily with women. In short, women are more essential to racial survival than men. If, for example, half the female population were exterminated—or

chose to be unproductive—the possibilities of reproduction would perforce be diminished one half; if, on the other hand, half the males were exterminated there need be no such diminution, the ovum being the indispensable factor. It is not difficult to see that the social organism rests upon this biological condition; both racial instincts and social mores decree that the protection and preservation of women is precedent to that of men, manifestly because women are racially the more precious. We might recall that ageless example in the Iliad of Hector's parting from Andromache, when he consciously went forth to his death in the forlorn hope of saving her and her children. . . . In any woman who possesses valuable traits which she has inherited and which she can pass on to offspring, the disposition to evade this obligation is a manifest racial delinquency. In order that those who are racially-minded might more often be saved from what they would later regret as a major error in their lives, it is highly desirable that all intelligent individuals, particularly women, should understand these and other simple biological facts as early as the period of adolescence."

By unimpeachable statistics it has been found that two-children families are quite inadequate, three-children families fall short, and that an average of four-children families is essential to secure the perpetuation of a desirable family strain. Contraceptionists, who are apparently devoting their chief propaganda to the restriction of births, are more or less unsympathetic to proposals on behalf of "positive eugenics" which would tend to *increase* breeding in the desirable racial element. As to this crucial point we do *not* discover that the birth-control advocates have ever proclaimed four-children families among the desirable population as an article of their creed. It is to be noted at once that contraception does not promise to increase the proportionate breeding in the racially desirable element of humanity, namely, to the four-children family standard.

On the contrary, certain proponents of birth-control are now compelled to admit that contraception has gone to diminish such breeding. In other words, *birth control, as distinguished from birth selection—the dynamic plank in Galton's eugenic platform—must thus far be classed among the neutral if not among the adverse influences of racial betterment.* As observed by Campbell, "The investigations of Dr. Himes into the results of contraceptive instruction in England wholly confirms this inference. The dysgenic element can be led to water but it cannot be counted upon to drink. Hence as between eugenic and dysgenic results, the present unfavorable balance against contraception has small prospect of being changed into a favorable balance by the universal access to contraceptive information. In other words, contraception promises, in the future as in the past, to prevent more eugenic births than dysgenic births."

Ethical Aspects of Scientific Modernism

As regards the ethical aspects of these problems, the contrast between the moral standards of Thomas Henry Huxley as seen in his "Aphorisms and Reflections"[3] up to the year 1895, and the satirical forecast in the year 1932 of the future "Brave New World" by his distinguished grandson, Aldous Huxley, gives us a vivid realization of the moral revolution of the past forty years. Such extreme modernism is more than a revolution. It is complete extermination of one great historic and prehistoric family code based upon hundreds of thousands of years of human experience. The new code is essentially nihilistic as far as all old codes are concerned, whether pagan or Christian.

In young Huxley's satire extreme modernism enters the final phase of its logical consequences, from which he recoils while he satirizes. The "Brave New World" opens with the chemico-mechanical reproduction of children, the obsolete ideals of courtship, family and the home being eliminated as well as all the romances and traditions adherent thereto:

> "I shall begin at the beginning," said the D. H. C. and the more zealous students recorded his intention in their notebooks: *Begin at the beginning.* "These," he waved his hand, "are the incubators." And opening an insulated door he showed them racks upon racks of numbered test-tubes. "The week's supply of ova. Kept," he explained, "at blood heat; whereas the male gametes," and here he opened another door, "They have to be kept at thirty-five instead of thirty-seven. Full blood heat sterilizes." Rams wrapped in thermogene beget no lambs. . . . He pointed. On a very slowly moving band a rack-full of test-tubes was entering a large metal box, another rack-full was emerging. Machinery faintly purred. It took eight minutes for the tubes to go through, he told them. Eight minutes of hard x-rays being about as much as an egg can stand. A few died; of the rest, the least susceptible divided into two; most put out four buds; some eight; all were returned to the incubators, where the buds began to develop; then, after two days, were suddenly chilled, chilled and checked. . . . Fertilize and bokanovskify—in other words, multiply by seventy-two—and you get an average of nearly eleven thousand brothers and sisters in a hundred and fifty batches of identical twins, all within two years of the same age. . . . "Only just eighteen months old. Over twelve thousand seven hundred children already, either decanted or in embryo. And still going strong. We'll beat them yet."

[3] "Aphorisms and Reflections" from the works of T. H. Huxley, selected by Henrietta A. Huxley, London, 1908.

The Controller shrugged his shoulders. "Because it's old; that's the chief reason. We haven't any use for old things here.

"Even when they're beautiful?"

"Particularly when they're beautiful. Beauty's attractive, and we don't want people to be attracted by old things. We want them to like the new ones." . . .

"The world's stable now. People are happy; they get what they want, and they never want what they can't get. They're well off; they're safe; they're never ill; they're not afraid of death; they're blissfully ignorant of passion and old age; they're plagued with no mothers or fathers; they've got no wives, or children, or lovers to feel strongly about; they're so conditioned that they practically can't help behaving as they ought to behave. And if anything should go wrong, there's *soma.*" . . .

"Our Ford himself did a great deal to shift the emphasis from truth and beauty to comfort and happiness. Mass production demanded the shift. Universal happiness keeps the wheels steadily turning; truth and beauty can't."

The elder Huxley, as I know from delightful personal acquaintance of the winter 1897–1880, was, with Charles Kingsley, one of the finest exponents of religious realism *versus* religious hypocrisy and sentimentalism. He admired virtue just as much as he despised cant. Of all my long and noble list of scientific acquaintances I can think of no one who would have so shuddered and revolted against the chemico-mechanical concept of future society as pictured in such unsparing, bold colors by his grandson. To the elder Huxley as to Goethe and far back in time to Cicero, nature was the supreme court of appeal; as in the following epitome of Huxley's natural code:

> The life, the fortune, and the happiness of every one of us, and, more or less, of those who are connected with us, do depend upon our knowing something of the rules of a game infinitely more difficult and complicated than chess. It is a game which has been played for untold ages, every man and woman of us being one of the two players in a game of his or her own. The chessboard is the world, the pieces are the phenomena of the universe, the rules of the game are what we call the laws of Nature. The player on the other side is hidden from us. We know that his play is always fair, just and patient. But also we know, to our cost, that he never overlooks a mistake, or makes the smallest allowance for ignorance. To the man who plays well, the highest stakes are paid, with that sort of overflowing generosity with which the strong shows delight in strength. And one who plays ill is checkmated—without haste, but without remorse.

I owe to Thomas Huxley the two outstanding principles of my own naturalistic philosophy; first, that nothing which is true can be harmful to the body, to the mind or to the soul; second, that whatever is natural in the wondrous and beautiful order of nature can not be fraught with danger. On the contrary, whatever is unnatural may not be essentially immoral but may be fraught with hidden dangers. Herein lies my general purpose and standpoint with regard to the main subject of this article. Birth-selection is natural; it is in the order of nature. Birth control is not natural and while undoubtedly beneficial and benevolent in its original purpose, it is fraught with danger to society at large and threatens rather than insures the upward ascent and evolution of the human race.

Such ascent, it seems to me, is the greatest responsibility with which we biologists and eugenists are charged to-day. I returned from my world tour more impressed than ever with the Galtonian principle of "not more but better and finer representatives of every race."

To begin at home, "not more but better Americans," raises the question, What is an American? recently debated in the New York *Times* (January 17, 1932) with a number of my distinguished compatriots. The substance of my contention in this symposium was that the "Simon-pure" American is not hyphenated. He has all the strong and all the weak points of the ancestral Nordic as well as of the more recent Alpine and Mediterranean stocks. He is possessed of certain qualities which make him far inferior to men of other races, an inferiority which he should freely admit and, as far as possible, rectify by education. He is now suffering severely from birth limitation which is seriously threatening the best strains of old American stock. He therefore needs to thoroughly understand the principles of birth selection rather than the principles of birth control. For him the Third Congress of Eugenics has a peculiar significance, but since the Congress is international it should carry an equally clear and distinctive message to each of the nations represented as well as to each of the primary races of mankind. The slogan "not more but better Americans" should have its counterpart in every country in the world in which the rising spirit of nationalism and of an entirely natural and reasonable pride should be accompanied by the consciousness that quality rather than quantity is the essential element of progress in every country and in every race.

With such principles in mind, and with the picture before me, of the world suffering acutely from dysgenic reproduction, from the multiplication of the incompetent, and from the alarming increase in the power of the criminal class, I can not refrain from expressing my deep conviction that, of all remedial and restorative agencies, the well-understood and well-applied principles of birth selection advocated by Galton, with birth control as a subsidiary principle, stand in the very front rank of progressive civilization.

SCIENCE SERVICE CONFERENCE. II

By Dr. FRANCIS G. BENEDICT

DIRECTOR OF THE NUTRITION LABORATORY, CARNEGIE INSTITUTION OF WASHINGTON

THE popularity of the spread of medical knowledge, knowledge of physiology and dietetics, is represented by the more common general interest in these subjects. There are probably more readers of Science Service who are interested in the medical news than in any other special classification. Consequently, it is one of the greatest services that can be rendered to the public, and likewise capable of very great errors. To the astronomer, and in the reporting of astronomical results, it is a matter of relative unimportance whether there is an error of one million or more light years, but to the general reader it is a matter of very great importance when there is an error made in the announcement of a medical or dietetic discovery.

The cautions outlined by Dr. Flexner seem to me to be absolutely essential. I could cite experiences where announcements by the press of medical discoveries or therapeutic discoveries have really wrought havoc. The influence of Science Service in bettering these conditions can hardly be overestimated, and we owe it a great debt for this step for the better. It has been stated here that we have no measure of the accuracy of newspaper reporting, but I feel that each of us has a very good measure, for if each one of us will take those subjects with which we are perfectly familiar and compare the factor of accuracy in the press reports of our own subjects with the press reports of other sciences and note what percentage of them are correct, we have a very fair measure of accuracy.

This comment on the inaccuracy of the presentation of medical matter in the press deals obviously only with those matters not handled through Science Service, and I wish to emphasize the extreme importance of the most careful control in medical or hygienic statements that are so readily and easily misinterpreted. In our modest field of endeavor many would be astonished to know some of the actual experiences we have undergone with pathetic cases of people arriving at our front steps in the belief that we had a new cure for diabetes, or something of that kind. It is, of course, infinitely worse with cancer cases. My comments are chiefly as a hint or particular warning to Science Service to exercise even greater scrutiny in releases of a medical nature.

Covering such a wide variety of scientific and other subjects, it is almost impossible to secure uniformity and equality of accuracy in all branches, and I think Science Service is to be congratulated on having done it so well. It is obvious that as years go on the service will improve. Were I located in Washington, I should be only too glad to offer my services gratuitously, in so far as they could be used, for any assistance in this work.

By Dr. PAUL R. HEYL

PHYSICIST, BUREAU OF STANDARDS

SCIENTIFIC discovery has its maxima and minima. There are times when there is first magnitude news to write about and there are no doubt other times when it is difficult to fill up the columns of the *Science News Letter* with things of the first importance. As a suggestion for possible sources for such periods, I wish to recall some experiences of my own student days. At that time it was frequently the custom of the presidents in both the British and American Associations to give a review of their sciences during the past year or often to go further and set forth the logical development of our ideas on a certain subject from primitive times up to the present. Such reviews were of great value to me in my student days in the formation of a perspective in dealing with the subject. I have found in later years that such reviews are still of interest to the lay audience. A historical résumé of our old and new ideas on a particular subject always excites a good deal of interest, and such articles can very well be utilized at times when first magnitude subjects are lacking.

By Dr. A. E. KENNELLY

PROFESSOR OF ELECTRICAL ENGINEERING, HARVARD UNIVERSITY

I AM a regular recipient of the *Science News Letter*, and read its columns with much interest. I sympathize heartily with the efforts that Science Service is making to act as an intermediary between the few thousand scientific investigators in this country and the hundreds of millions of English-reading laymen in this country and abroad, who desire to receive non-technical information of what is going on in the scientific world.

The task of such an intermediary journal is not an easy one. Articles of the right length, and suitable literary style, have to be prepared with reference to definite dates, upon specific technical topics. These technical topics, when emerging from the laboratory, naturally tend to be expressed in the technical code language of the scientific specialty to which they belong. In order to be acceptable to the public, they have to be decoded, and infused with a suitable amount of human interest. To carry out this program without sacrifice of the needed degree of ac-

curacy, and with the proper emphasis upon the important points in the communication, calls for special training in and knowledge of the fine art of popular scientific presentation. In my own opinion, Science Service deserves commendation for the measure of success it has attained.

There are two points in which it has seemed to me that Science Service articles might sometimes be improved.

(1) *Emphasis.* When a scientific communication is presented in suitable form for public appreciation, we all know how important it is that the emphasis should be laid in the right place, especially from the historic point of view. An accurate presentation may convey an inaccurate impression, by reason of laying emphasis on the wrong point. Only a specialist in any particular line of scientific work can correctly decide where the emphasis should be placed, and manuscripts should be referred to some junior specialist in that line, before publication, in order to ascertain that the emphasis has been correctly placed.

(2) *Metric System Retention.* The international quantitative language of science is in terms of the Metric System, which employs the meter, the liter and the gram. These terms should be used in scientific descriptions addressed to the public, partly because all persons interested in science must necessarily acquire some knowledge of the Metric System, and partly because the vast audience, in foreign countries, able to read English and appreciate Science Service literature, can only be satisfied if the simple metric terms are used. This does not mean, of course, that Science Service should attempt to lead metric reform, or endeavor to force the use of the Metric System upon those who may not desire to use it; but merely that the standard type of scientific communication should retain its international metric quality, with customary local national units inserted in parentheses, by way of explanation, only when considered necessary.

By Dr. CHARLES R. STOCKARD

PROFESSOR OF ANATOMY, CORNELL UNIVERSITY MEDICAL COLLEGE

REMARKS relating to medical discoveries have been made by both Dr. Flexner and Dr. Benedict. I fully agree with what they have said and would like to add that in presenting scientific news to the public it would be well to keep in mind that matter derived from different sciences should probably be presented in somewhat different ways. In the case of physics and chemistry, for example, there are no outside prejudices or superstitions concerned, whereas in presenting biological and medical studies one must realize that groups of people in almost every country —the anti-vivisectionists, anti-evolutionists and certain cults—are unreasonably prejudiced against animal experimentation. The existence of such attitudes makes it rather necessary that the reports of scientific developments in biology and medicine be presented in a more discreet and judicious manner than is necessary where these prejudices are not involved. In several of the states, as well as in Congress, there are at present active campaigns being carried on against animal experimentation. This threatens interference not only with the study of human and animal diseases but also might interfere in a general way with a number of biological and agricultural experiments involving the economic handling and breeding of animals. While Science Service is definitely opposed to propaganda, yet there might be valuable opportunities for properly emphasizing, in reports on biological and medical sciences, the result of new curative proceedings which bring out the great economic and humanitarian benefits that are only possible to obtain by very extensive experiments on animals.

In this way Science Service could help not only to bring needed material support to science but aid in preventing handicaps to its progress.

One important piece of medical study done during the last few years has not been reported by Science Service, and forms a most convenient illustration of results which might be used to counteract propaganda and thus aid science. Several years ago the Medical Research Council of England, supposedly interested mainly in human disease, undertook a very extensive experiment for the study and control of distemper in dogs. This investigation was carried out in a most successful way. As a result it is perfectly practical to immunize dogs against distemper, and this method of immunization may ultimately eliminate the most terrible disease among dogs. Without extensive experiments with dogs, such results could not have been accomplished.

Science Service could do very much, not only to acquaint the public, but also to interest the public in resisting prejudiced groups who are trying, through legislation, to interfere with scientific investigations of life and disease not only in man but in other animals as well.

By Dr. JOEL H. HILDEBRAND

PROFESSOR OF CHEMISTRY, UNIVERSITY OF CALIFORNIA

I WISH to suggest the desirability of making a more definite effort to set before the lay public not only the results, but the processes of scientific discovery. A mere cataloging of scientific achievements, while calculated to convince people of the material benefits of science, may, like the average school course in gen-

eral science, fail to give that appreciation of science as a spirit and method upon which its dignity and human value ultimately depend. It is surely important for the public to think of science as something more than a magic hat out of which can be drawn a miscellany of such products as stunning dyes, new medicines for new diseases and devices for increasing domestic noise. There is still a large majority of our population who regard science as a basis for technology rather than as an untried method of attack upon the depression.

To tell how a discovery was made is journalistically more difficult than to state the bare result, but I have no doubt that journalistic talent exists which is capable of it. The sports writers certainly do not content themselves with the score, but know how to describe the game; a polar expedition is written up so as to give the thrill of the quest and not merely an accurate description of the pole. I believe that a skilful journalist who has as much understanding of scientific matters as a competent sports writer has of his field could be trusted to write stories of discovery which would have as much popular appeal as did the lectures of Sir Humphrey Davy.

By Dr. T. WAYLAND VAUGHAN

DIRECTOR, SCRIPPS INSTITUTE OF OCEANOGRAPHY

Two problems have been mentioned. One is the interrelationship between the different agencies that report scientific information. I understand that that is not to be discussed this afternoon, although the matter has been broached. The other is the matter of getting scientific information before the public. We have so far talked more about the matter from the standpoint of the newspaper than from the standpoint of the scientific man. Therefore, I shall make a few remarks about what I think the attitude of the scientific man should be.

I have had a rather long experience with newspaper men from the time I was a youngster in the United States Geological Survey to the present time, and I have had most agreeable relations with them throughout.

I will tell one short story. In the summer of 1900 I was in Vicksburg, Mississippi. A reporter interviewed me and undertook to write an account of what I was doing there. In his account of the geological history of the area he made mistakes in the details, but in my opinion he got the major things right. They were that a visitor was in town, and that from the rocks in the vicinity of Vicksburg an interesting story could be extracted. The errors in detail were not of great significance.

We should be sympathetic toward the newspaper man, because, by helping him, he can produce about our work articles that are really excellent. If we take pains with the newspaper man, we can make him understand the most important things in our work. We should collaborate with him and bear our part of the responsibility in preparing reports for the public.

By Dr. F. P. KEPPEL

PRESIDENT OF THE CARNEGIE CORPORATION

I SPEAK neither as a man of science nor as one concerned with editorial or reportorial matters. I would like to say a word in favor of Science Service sticking to its present last, because I think we have not yet had an opportunity to see how tremendously important that is. I will take one aspect of the question that has not yet been touched upon. If you have occasion to look up an Englishman in the English "Who's Who," you will find among the things that seem really worthy of mention is his hobbies. In the American "Who's Who" a man's hobby is never mentioned, and the reason is, I think, that the English civilization regards the hobbies of people as important, not so much for their contribution to science as for the purpose of giving an idea of the human personality of the man in question. The charter of the Carnegie Corporation specifies that its purpose is not only for the advancement of knowledge but the diffusion of knowledge; so that all these matters touch us very closely.

We have been interested lately in things connected with adult education, and by the process of trial and error we have learned something about adult education in the United States. We have, as compared with other countries, paid very much more attention to vocational training as against non-vocational, but there is a great and growing interest on the part of individuals in the latter. I think I am correct in saying that the share of the natural sciences in non-vocational adult education is not nearly as high as it should be or as it might be made. We do not get very much education from the casual, rapid reading of the newspapers, but I hope that here and there somebody will take a more consistent interest in some particular field, and it is quite possible that Science Service may be able, in addition to furnishing material for the newspapers, to give to such people the service that it is equipped to give and to start them toward a more concentrated and useful work in some particular branch of science. I hope Science Service will stick to this particular field where it is alone and not enter into the field of what have been called the "unnatural sciences."

By Dr. RICHARD M. FIELD

ASSOCIATE PROFESSOR OF STRATIGRAPHY AND HISTORICAL GEOLOGY, PRINCETON UNIVERSITY

I HAVE listened to the discussion with a great deal of interest, although I imagine that the newspaper

men are already fairly well acquainted with a number of the problems that have been raised. I understand that the matter under discussion is the liaison between the press and science, which, in itself, presents certain difficulties. I feel very strongly that the newspapers, and especially certain newspapers, have done a great deal to increase the public interest in scientific matters, but more particularly to advertise the scientific man himself. As certain scientists seem to be better able to interest the press than others, it occurs to me that one of the most valuable contributions of Science Service is to see that the excellent work of the unusually modest or retiring members of our fraternity be brought to the attention of the public.

I would take exception, however, to one or two statements that have been made as to just what this meeting has been called for. The main idea, I feel, has been most aptly expressed by Dr. Merriam. As Dr. Merriam does not happen to be in the room at the present moment, he is relieved of the necessity of listening to my discussion of his remarks. Dr. Merriam emphasized the fundamentals of the general question before us in excellent fashion. His suggestions to both the gentlemen of the press and to the scientist were keen but tempered. He took up the question of sources of information, their quantity, and particularly their quality. As to the question of quality, Dr. Merriam's comments, in my estimation, are fully as applicable to Science Service as to the press. Dr. Merriam also suggested that a grave responsibility rests with the scientist himself; and that if he is not willing to take the time and the trouble to translate his work to the public, he can not expect that Science Service or the reporter can do it for him. Unfortunately, there are few scientific men who write in the way that most of us, deep down in our hearts, would like to.

And that leads me to a point that I hope is at least on the border of this discussion. I hope so, because I feel that it is so vital that the press will see its way clear to help. It certainly contains elements of human interest. In just what way may what the scientist considers to be facts regarding man's environment be kept clearly before the public in these momentous times? How may the scientist, as is his duty, help to divorce the purely emotional or political from the scientific treatment of a problem? In Washington there are a number of great scientific bureaus whose particular duty is to advise the public as well as the government in just such matters. I sincerely hope that in the necessity for economy Congress will not so cripple these bureaus that they will not be able to carry on properly their functions, which are as badly needed now as in 1918. I have the temerity to say that this matter should not be settled according to the total number of federal employees, but rather according to the value of each employee to his government in times of stress.

By Captain J. F. HELLWEG

U. S. NAVAL OBSERVATORY

IT is not always so important what you put in a paper as what you keep out. This idea is best illustrated by an incident about eighteen years ago. For about ten years we were interested in trying to devise a positive means so that a ship in a sea fight could distinguish her own shots. After working some years to develop this, you can imagine our surprise when we saw the whole thing in the newspapers one morning.

There are people in this country who are paid to get information which might be of value to countries on the other side of the ocean.

Another feature. They have in all the other countries—I don't know exactly the title—but it is a law for the protection of the realm. Any information, patents, mechanisms, weapons or material which in even the most remote way could affect the safety of the realm is not allowed to be published. We are not so careful. As soon as we say or do anything, the world knows it through the press. Frequently a device intended for one purpose can be very readily adapted to another. In the early part of the war, some one came to Washington with an idea he thought was wonderful. It was useless to us for its designed purpose, but we used it very successfully in the North Sea to keep the German fleet from coming out. It is very important not to tell everything. It is far more difficult to decide what not to publish than it is to decide what to publish.

By Dr. KNIGHT DUNLAP

PROFESSOR OF EXPERIMENTAL PSYCHOLOGY, THE JOHNS HOPKINS UNIVERSITY

I HAVE listened with interest to a number of very excellent ideas that have been expressed, but I doubt whether many of those ideas are much news to Science Service. There have been some suggestions made which I strongly suspect would be revised if the makers of the suggestions would familiarize themselves with the actual problems and difficulties which Science Service has and the attempts they are making to surmount them. It seems to me the position taken by almost everybody is that Science Service has merely to find out what to do and then go ahead and do it. I have had enough informal acquaintance with Science Service to find out that is not the case. The difficulties are not so easily surmounted. I think we will have to agree with several speakers that Science

Service has made very striking progress towards the surmounting of those difficulties.

The difficulty of getting authentication for reports is no new thing to Mr. Davis or any other member of the Science Service board. I happen to know the means they use to surmount that difficulty.

The fact that Science Service has made a distinct success is perhaps not so easily recognized, unless we consider the conditions of the publication of scientific material before Science Service entered the field. We have been told there are other avenues of publication. What would happen to those avenues if Science Service ceased to be a factor in the field? Well, we know what would happen. We know what the difficulties were before Science Service became active. We agree with those who praise the newspaper men. I agree, in fact, with almost everybody. I have had experience with newspaper men. There used to be great difficulty in getting newspaper men to take scientific results seriously. That trouble is largely past because of Science Service. Science Service is struggling with very definite difficulties, but I think it does pretty well in keeping its material in good shape.

By Dr. WILLIAM H. HOWELL

VICE-PRESIDENT AND CHAIRMAN OF THE EXECUTIVE COMMITTEE OF SCIENCE SERVICE

IT is not possible for me to summarize in any adequate way the remarks made by the various speakers this afternoon, but it is a pleasure to express on the part of the Trustees of Science Service our appreciation of the helpful and friendly suggestions that have been offered from so many different points of view. All the speakers have recognized the difficulties inherent in the effort to popularize science, and at the same time they have not failed to emphasize the importance of the undertaking.

The value, if not the necessity, of providing for the instruction of the public in the progress of science is evident from two considerations. In the first place, it is vitally important for the support of scientific work. In the olden days the scientist obtained his necessary financial assistance from individual patrons, but he paid for it often times, as one may gather from the fulsome dedications of their books, by an obsequious servility that would not be acceptable under present conditions. In these days with our large and expensive undertakings the patron to whom we must apply for aid is the general public, and it follows that we must keep this public informed and interested if we hope to obtain the continued and increasing support that is necessary for our large projects.

In the second place, it is a part of the larger purposes of science to make its discoveries contribute to the advancement of civilization. While the individual worker may be driven by curiosity or a personal desire for fame or gain, the underlying aim of science as a whole is to bring benefits to humanity on both the material and the spiritual side. The material advantages are evident enough, but the spiritual gains are no less important. It is not necessary to labor the point. Only the truth can free us from the hampering prejudices and superstitions of life, and the discovery of truth is the great end and aim of scientific work. Whatever it attains should be passed over as promptly as possible to the general public to help them in the difficult task of regulating their individual and communal lives.

On the practical side, one great difficulty in popularizing science lies in the art of translating its technical terminology into the vernacular of the people in such a way as to present the story both attractively and accurately. All of us who have attempted to do it know its difficulties and dangers. One must avoid, on the one hand, the dry-as-dust language of the pedant, and, on the other, that kind of over-statement and false appeal to the emotions which in the end defeats its own purpose and of which we have so many tiresome examples in radio advertising and newspaper reporting. The art of popularizing science properly is, no doubt, a special gift. When we of the older generation think of it our minds go back to the beautiful essays of Huxley and Tyndall. We can not of course keep Huxleys and Tyndalls on our staff, but they may serve as examples, and the lucidity and charm of their style furnish an ideal to be studied and imitated. In the course of time, by the method of trial and error we may hope to discover and develop a group of writers with special talents for this kind of exposition.

Permit me to thank you again for your willingness to participate in this conference and for the many helpful criticisms and suggestions that we have derived from your discussions.

OBITUARY

JOHN WALTER GREGORY

"DROWNED by the capsizing of his canoe on the Urubamba." Thus has passed Dr. J. W. Gregory, at the age of sixty-eight, continuing to the last his brilliant career of tireless exploration. British geology has lost one of its most intrepid leaders, and his fellow scientists the world over will miss his stimulating thought.

It is not my privilege to review the varied aspects of his life as administrator, teacher, explorer and scientist. Although known to me through his observations in Africa, Australia and Chinese Tibet, he remained an impersonal thinker among my colleagues until we had both passed threescore and more. I first met him in his home at Glasgow, when on my way to Africa to study the Rift valleys, his own special subject.

We were then mutually aware of pronounced differences of opinion on theoretical questions, but the frank, cordial reception accorded me disarmed for all time any instinct of intellectual antagonism and quickly established happy relations. In long and earnest discussions, I found him a well-informed and aggressive opponent, strongly convinced of the essential soundness of the geologic philosophy of Eduard Suess.

His convictions were natural. In the fluid medium of speculation, where free-swimming facts may group themselves at will, ideas take forms determined by bent of mind and circumstance. The agreement between thinkers so unlike as Suess and Gregory illustrates the effect.

In Gregory's youth, Suess was already the master philosopher of European geology. Certain racial characteristics distinguished the younger from the older man, but there was between them an intellectual link in that both used their great powers of imagination creatively.

Suess was the embodiment of German *Gemüthlichkeit*. He loved his home above all else. He had voluntarily become sessile, early in life. His scientific thought was contemplative. He read, absorbed and moulded the observations of others to create the *Antlitz* of the world of his imagining. Gregory, by contrast, was intensely active. His habit of observation was objective. He traveled far and wide to accumulate facts. But he also possessed a creative imagination that was strong of wing.

While still a daring, enthusiastic youth (in fact, he was never any other, where danger was concerned) Gregory explored the Great Rift valley of East Africa and found it to be a tension rift. Suess, on the evidence of more casual descriptions, had conceived it to be part of a great rent, 4,000 miles long, torn through Africa and Arabia by the subsidence of that part of the suppositious Gondwana continent which occupied the site of the Indian ocean. Here was an agreement of observation on the part of Gregory with the inference on the part of Suess, which could not but be convincing. The grandeur of the concepts appealed to Gregory's poetic thought, and he became for life an advocate of Suess's ideas of the development of the Indian Ocean basin by the foundering of Gondwana land.

It is well known that weighty arguments in support of the general theory of lost continents may be adduced from paleontology, from the geologic histories of Africa, Asia and the Americas, as also from climatic changes throughout geologic time. Gregory was master of them all. The scope of his knowledge was all-embracing. An eager student, a bold investigator, a rapid thinker, endowed with a capacious memory for facts and constructive capacity for synthesis, he became, as the result of his far-flung explorations, an outstanding authority on the world as a whole.

He was, however, far from being a dogmatic theorist. Though tenacious and formidable in argument, he recognized the incompleteness of geologic evidence and appreciated the obligation to consider advances in knowledge. In 1915 he wrote in "Geology of Today":

> In order to free geology from hopeless attempts to solve problems which could not be solved with the knowledge then available and to get rid of the incubus of unscientific and premature hypotheses, a group of English geologists founded the Geological Society of London.

To that purpose he was loyal. In the words of Lyell, he conceived the ideal of the founders to have been "to multiply and record observations," and to that end he dared every risk and devoted his life unsparingly.

He passed, as he would have wished, in active service. He leaves a most eminent name in the roster of great British geologists, but it can not fill the emptiness in the hearts of his friends.

BAILEY WILLIS

WILLIAM HITTELL SHERZER

IN the death of Professor Sherzer on July 17, Michigan lost a distinguished teacher and geologist. For forty years he was head of the department of natural science in the State Normal College at Ypsilanti, and is best known throughout the state for his energetic promotion of the study of nature in the elementary curriculum. His collection of material for giving teacher training in this work is probably unexcelled.

Outside the teaching profession he is known for his geological reports in both state and federal surveys. Among the former are the surveys of Wayne and Monroe Counties, published by the State Geological and Biological Survey. His Detroit Folio of the United States Geological Atlas is a prominent contribution to that publication. Under the direction of the Smithsonian Institution he made a study of the principal accessible glaciers of the Canadian Rockies and Selkirks of British Columbia and Alberta. His account of this expedition is embodied in the reports of the institution.

He was consulting geologist for the city of Detroit in establishing a suitable location for the Detroit River tunnel, and many shorter papers and reports are found in geological publications.

Professor Sherzer did his postgraduate work at the Universities of Michigan and Berlin. The doctorate was conferred on him by the former in 1901. Born at Franklin, Ohio, he died at his summer home near Ann Arbor at the age of seventy-two years.

FREDERICK R. GORTON

STATE NORMAL COLLEGE,
YPSILANTI, MICHIGAN

RECENT DEATHS

DR. HUGH A. BROWN, director of reclamation economics in the Interior Department, died suddenly on August 13.

W. H. SCHUERMAN, dean of the school of engineering at Vanderbilt University, died suddenly on August 11 at the age of seventy-three years.

DR. EDWARD W. TAYLOR, emeritus professor of neurology at Harvard University, one-time editor of *The Boston Medical and Surgical Journal* and associate editor of *The Journal of Nervous and Mental Diseases,* died on August 17 at the age of sixty-six years.

THE death is announced of Charles C. Conser, associate professor of physiology at the University of Maryland.

DR. JOHN CHARLES FIELD, head of the department of mathematics at the University of Toronto, died on August 10 at the age of seventy years.

GEORGE BARVOW, late of the British Geological Survey, died on July 24, at the age of seventy-eight years.

CAPTAIN POULETT WEATHERBY, of Bournemouth, England, geographer and African explorer, who discovered the source of the Congo, has died at the age of seventy-two years.

THE death is announced of Dr. Ludwig Haberlandt, professor of physiology at Innsbruck.

THE death is announced, at the age of sixty-three years, of Dr. Rudolf Kraus, of the State Serum Institute in Santiago de Chile.

JOHN R. F. SEBELIEN, formerly professor of chemistry in the Agricultural College, Aas, Norway, known for his contributions to the chemistry of milk and dairy feeding and artificial manures, has died at the age of seventy-four years.

SCIENTIFIC EVENTS

INTERNATIONAL SCIENTIFIC CENTERS IN PARIS

Nature reports that La Maison du Savant, which is to be built in Paris, will be a well-appointed meeting-place for French and foreign men of science, if the present plans come to fruition. Lecture rooms, a restaurant, a winter-garden, etc., will be at the disposal of members and visitors. In addition, it will possess an extensive office of information which will study projects for the erection of up-to-date laboratories and research institutions, and organize congresses, exhibitions, conferences and all publicity necessary to attain the organization's aims. An illustrated periodical will also be published eventually, to inform the public of the general progress of science. Other activities include a benevolent fund and the provision of scholarships. The Maison du Savant is under the patronage of M. Lebrun, President of the French Republic; it has received government support, and its honorary committee consists of a distinguished group of academicians, including MM. le Chatelier, Charcot, le duc de Broglie, Richet, etc. Its founder and president is M. Georges Lecuyer, president of the International Union of Decorative Arts, and its active director is M. Jean de Chappedelaine. The organization hopes to raise fifty million francs in the near future for its extensive program. Through the official support of the Chamber of Deputies and the Municipality of Paris, a beginning has been made with convenient office rooms at 5 Avenue de l'Opéra, Paris.

"La Maison Internationale de la Science" is a project put forward on the occasion of the Colonial Exhibition of last year, during an International Congress of Men of Science and Research Workers, for the furtherance of their interests. Its temporary headquarters are at the Institut Marey, Avenue Gordon-Bennett, Paris. It has not been very active, owing to the absence of its director, M. Pélissier, on a government mission to the island of Réunion; in all probability it will join forces with the Maison du Savant. "Le Foyer International Universitaire" is a center planned by the University of Paris. It was to be housed in part of the hôtel de la Rochefoucauld d'Estissac; this, however, has been bought by the "Maison de la Chimie" for three million francs, which will be used by the "Foyer International Universitaire" to acquire another building in rue de la Four (the former École de Bouffémont). "Le Cercle Universitaire International" is a club projected by the Associations of University Students to receive visiting colleagues and university men and to organize meet-

ings and lectures that will promote international friendship. Its president is M. Paul Langevin, and its temporary address is at the Musée Pédagogique, 41 rue Gay-Lussac, Paris.

SECOND INTERNATIONAL POLAR YEAR

THE Second International Polar Year, which is to continue for 13 months, is now under way, since it began on August 1st, and while it is so new that reports have not yet arrived in this country to tell us which stations are actually at work and which are still making preparations, enough is known to assure that the undertaking will be a success.

A direct outcome of the appropriation by the last Congress of $30,000 for participation in the Second Polar Year program is the establishment of the so-called College-Fairbanks Polar Year Station in the interior of Alaska not far from the Arctic Circle and from the belt of maximum auroral frequency. Its position at the terminus of the Alaska Railroad has been particularly helpful in view of unavoidable delays in getting the project started. Furthermore, the active cooperation of Dr. Charles E. Bunnell, president of the Alaska Agricultural College and School of Mines, has been indispensable.

The College-Fairbanks station will be quite comparable in range of activity with any other Polar Year Station. The plans include magnetic, atmospheric electric, earth current, radio transmission and auroral observations and in the same vicinity there will be meteorological, including upper air, observations. The significance of simultaneous observations at a favorable point where little has heretofore been known can not be overemphasized. Heretofore there have only been four places where atmospheric electric and earth current observations have been going on at the same time. These include the Carnegie Institution of Washington observatories in Peru and Australia, the observatory at Ebro, Spain, and the Tucson Magnetic Observatory of the Coast and Geodetic Survey, where cooperation of the Carnegie Institution of Washington and the Mountain States Telephone and Telegraph Company have made possible such a program. However, at none of these have systematic radio observations been made. The Coast and Geodetic Survey has had occasion to observe the demand on the part of the students of radio transmission for magnetic information, since it has been obliged to furnish, long in advance of compilation of the results, copies of the magnetograms or lists of daily ranges of the magnetic elements from several of its observatories to investigators of radio transmission, including government scientific bureaus, scientific organizations and wire, cable and broadcasting companies.

The station is the result of the cooperative activity of a number of organizations which probably would not have been forthcoming unless Congress had taken the action that it did. These include the State Department, to whom the appropriation was made, the Department of Commerce through the Bureau of Standards in addition to the Coast and Geodetic Survey, the Navy Department through the Naval Research Laboratory, the War Department through the Signal Corps, the Interior Department through furnishing special facilities in Alaska and valuable information, the Carnegie Institution of Washington through its Department of Terrestrial Magnetism, the Alaska Agricultural College and School of Mines and private individuals.

The station is in the administrative charge of the senior representative of the Coast and Geodetic Survey. Mr. F. P. Ulrich, who on his regular duty is in charge of the Sitka Magnetic and Seismological Observatory, is erecting the buildings and installing the instruments. As soon as practicable he will be relieved by Mr. Everett R. Johnson and will then return to Sitka. Mr. H. F. Bennett will be the assistant magnetic observer. The Naval Research Laboratory will have Dr. H. B. Maris, associate physicist, and Mr. C. E. Johnson, radio man first class, U. S. N. The Carnegie Institution will have Messrs. W. J. Rooney and K. H. Sherman, who are expert in atmospheric electric and earth current work. The 5-year plan of auroral work which was made possible through a grant by the Rockefeller Foundation and which is being carried on by Professor V. R. Fuller and other personnel of the Alaska Agricultural College and School of Mines will continue throughout the Polar Year. The regular personnel of the Weather Bureau will carry on the meteorological work.

The activities in other countries are numerous, and 33 nations are taking part. The Polar Year Commission, of which Mr. John A. Fleming, of the Carnegie Institution of Washington, and Dr. N. H. Heck, of the Coast and Geodetic Survey, are the American members, will undoubtedly be ready in the near future to issue a statement as to the progress being made by the different countries.

The plan for the Polar Year program was a spontaneous outcome of the success of the First Polar Year fifty years ago. While the working out of plans has been carried on in many different countries the work as a whole has been fostered by the Second Polar Year Commission. This was organized in 1929 and placed under the direction of Dr. D. La Cour, of Denmark, and the successful world-wide outcome under difficult conditions is to be credited largely to his initiative. The Polar Year for the Antarctic and other parts of the Southern Hemisphere which are

difficult of access during the southern winter are to start their Polar Year on January 1, 1933, but will likewise, insofar as practicable, extend the program over 13 months.

While the fundamental activities, magnetic and meteorological observations, are the same for the First and Second Polar Years, there is a great contrast in the associated activities, practically all of which were undreamed of at the time of the First Polar Year. Our knowledge of the interrelations of the different phenomena that are to be observed is still very inadequate both from the scientific and from the practical view-point. The results will be of very great value to all the organizations which are taking part and indirectly to the inhabitants of the earth as a whole. Not only will the government activities, which usually emphasize the practical view-point, benefit, but such organizations as the Carnegie Institution of Washington, which is making a study of the earth's magnetism as a whole, will find that the filling of important gaps in observations will aid greatly in their attack on the problem.

R. S. PATTON,
Director, U. S. Coast and Geodetic Survey

THE DEPARTMENT OF PHYSICS AT THE UNIVERSITY OF CALIFORNIA

TWELVE physicists have selected the University of California department of physics as a place to carry on research during the coming academic year, according to an announcement made by Professor E. E. Hall, chairman of the department.

Two men will come to Berkeley as Rockefeller Foundation Fellows, to work with Professor R. T. Birge. They will be: Dr. H. O. Kneser, of the University of Marburg, Germany, due in Berkeley about October 1, and Dr. Rafael Grinfeld, of La Plata University, Argentine, starting about September 15.

Dr. Robley D. Evans, National Research Council Fellow from the California Institute of Technology, will arrive about September 1 to work with Professor Leonard Loeb. Dr. Wendell H. Furry, another National Research Council Fellow, will arrive about August 15 to work with Associate Professor J. R. Oppenheimer. Dr. F. L. Nutting, of the Drexel Institute, Philadelphia, is now working in the department on certain properties of quartz under the action of x-rays.

Other research men will work with Professor E. O. Lawrence, head of the new Radiation Laboratory. They will be Dr. Malcolm C. Henderson, of the University of Cambridge and honorary fellow at Yale University, who will visit from August 15 to December 31; Dr. John J. Livingood, instructor in physics last year at Princeton, arriving about August 15; Dr. Edwin M. McMillan, National Research Council Fellow from Princeton, arriving about October 1; Dr. Donald Cooksey, Yale University, visiting between August 1 and September 15; Dr. F. N. D. Kurie, Yale University, August 1 to September 15; Dr. James Brady, research fellow at St. Louis University, working until August 31. Dr. M. S. Livingston, alumnus of the University of California, is expected to continue work in the radiation laboratory.

THE YORK MEETING OF THE BRITISH ASSOCIATION

THE British Association for the Advancement of Science will meet in York from Wednesday, August 31 to Wednesday, September 7. According to a summary of the final program given in the London *Times*, the inaugural general meeting, at which the presidential address will be given by Sir Alfred Ewing, will be held on the evening of the opening day. Subjects for discussion include the suppression of noise, forestry, films as a cultural and educational force, deep-focus earthquakes, the electric propulsion of ships and the preparation and uses of statistics in business. Mr. R. Borlase Matthews will speak to Section G on the "Distribution and Utilization of Power from the Grid," and Sir W. M. Flinders Petrie will address Section H on "Copper and Bronze in Palestine." Lieutenant-Colonel Sir David Prain will give his presidential address to the conference of delegates from corresponding societies on "The Conservation of Wild Life in Relation to the Scheme for National Parks."

On Friday, Professor R. B. Forrester will deliver his presidential address to Section F on "Britain's Access to Oversea Markets," and Professor Miles Walker will give his to Section G on "The Call to the Engineer and Scientist." Another presidential address on this day will be to Section L by Mr. W. H. Heller on "The Advancement of Science in Schools: Its Magnitude, Direction and Sense." There will be a discussion on "Crop Production, with Special Reference to the Increased Use of Mechanical Power." In Section G, Mr. A. P. M. Fleming will give "An Engineer's Review of the Soviet Enterprise," and Dr. J. Burtt Davy will talk to Section K on "The Cricket Bat Willow."

Three sectional presidential addresses will be given on Monday. Professor P. G. H. Boswell will speak to Section C on "The Contacts of Geology: the Ice Age and Early Man in Britain." Professor B. Edgell's address to Section J will be on "Current Constructive Theories in Psychology," and Professor J. H. Priestley will discourse to Section K on "The Growing Tree." There will be a discussion on railway

traction, contributed to by Sir Seymour B. Tritton (steam power), Sir Henry Fowler (oil engine power), and Mr. F. Lydall (electric power). In Section D, Dr. Stanley Kemp will deal with "Oceanography in the Antarctic," and Mr. A. C. Stephen with "The Faunistic Divisions of the Floor of the North Sea." Professor A. C. Hardy will speak on "Plankton Research in the Service of the Fishing Industry." In the afternoon there will be a discussion in Sections D and H on "The Primates and Early Man," in which part will be taken by Dr. C. Tate Regan, Dr. A. B. Appleton, Professor J. S. Shellshear, Dr. S. Zuckerman and Dr. Carter, and another on "The Techniques, Possibilities and Limitations of the Measurement of Human Effort as a Basis of Monetary Reward." This will be in Section F; the chairman will be Dr. C. S. Myers, and those taking part will include Dr. C. H. Northcott and Dr. G. H. Miles.

The program on Tuesday includes a discussion in Section M on "The Distribution of Agricultural Products," and addresses on "Recent Changes in the Wheat Areas of the World," in Section E, by Mr. G. V. Jacks, and on "Effects of the World Depression on the Banking Systems of Central Europe," in Section F, by Dr. E. Roll. At the conference of delegates of corresponding societies Dr. C. B. Williams and Captain T. Dannreuther will explain "A Scheme for Recording Immigrant Insects in Great Britain." On Wednesday, Professor J. R. Bellerby will address Section F on "Inflation, the International Remedy," and in Section H, Mr. M. E. L. Mallowan will speak on "The Prehistoric Civilizations of Nineveh."

Two evening discourses have been arranged, one by Sir Arthur Hill on "Plant Products of the Empire in Relation to Human Needs," and the other by Mr. C. C. Paterson on "Uses of the Photo-electric Cell." Other evening engagements are the reception on Thursday by the Lord Mayor of York, Mr. R. H. Vernon Wragge, and the Sheriff, Mr. Arnold S. Rowntree, in the Exhibition Buildings, a public lecture by Mr. H. E. Wimperis in the Cooperative Hall on "Speed in Flight," and a discussion in Section L on "The Place of Science in the Education of Boys and Girls up to Sixteen Years of Age." The subject will be introduced by Sir Richard Gregory, and he will be followed by Sir H. B. Hartley, Mr. Donald Gray, Dr. W. W. Vaughan, Professor W. W. Watts and Mr. W. M. Heller.

An extensive program of visits to places of interest has been drawn up.

SCIENTIFIC NOTES AND NEWS

DR. ARTHUR H. COMPTON, professor of physics at the University of Chicago, has been elected a corresponding member of the Prussian Academy of Sciences.

AT the recent meeting of the American Society of Agricultural Engineers, Major O. V. P. Stout of Berkeley, irrigation engineer in the U. S. Department of Agriculture, was awarded the Cyrus W. McCormick medal, conferred annually in recognition of the most notable contribution in engineering for the year.

C. A. MENZEL, associate engineer at the Research Laboratory of the Portland Cement Association, was awarded the Charles B. Dudley Medal for 1932 at the thirty-fifth annual meeting of the American Society for Testing Materials. This medal, commemorating the name of the society's first president, is awarded annually to the author of a paper presented at the preceding annual meeting, which is of outstanding merit and constitutes an original contribution to research in engineering materials.

JOHN R. BAYLIS, physical chemist of the City of Chicago, was awarded, for work on activated carbon in water, the John M. Goodell Medal of the American Water Works Association at its fifty-second annual convention.

THE Longstaff Medal has been awarded by the Chemical Society of London jointly to Professor W. N. Haworth, of the University of Birmingham, and Sir James Irvine, of the University of St. Andrews, for their work on the chemistry of the sugars.

LECTURERS have been appointed by the Royal College of Physicians, London, as follows: For 1933 Sir Thomas Lewis, Harveian orator; Sir Humphry Rolleston, Fitzpatrick lecturer; Dr. C. S. Myers, Bradshaw lecturer; Dr. C. R. Box, Lumleian lecturer; Dr. C. E. Newman, Goulstonian lecturer; Dr. E. A. Carmichael, Oliver-Sharpey lecturer; Dr. W. G. Savage, Mitchell lecturer, and for 1934 Professor O. L. V. S. de Wesselow, Croonian lecturer.

IN honor of Professor Henry C. Sherman, head of the department of chemistry at Columbia University, a dinner was given recently in the Women's Faculty Club at the University of California, by a group of nutrition workers. Dr. Agnes Fay Morgan, of the department of household science, introduced Dr. Sherman, who spoke on his recent vitamin researches.

DR. M. A. BLISS, St. Louis, a member of the board of managers of Missouri eleemosynary institutions, for several years president of the Missouri Society of Mental Hygiene, was recently presented with the

Distinguished Service Medal for conspicuous service in private life, the first award of the medal since its authorization by the last legislature. The presentation was made by Governor Caulfield in the State Senate Chamber, with prominent physicians and members of the state eleemosynary board in attendance. Dr. Bliss organized the Child Guidance Clinic of St. Louis and the St. Louis Training School for the Feebleminded.

JOHN EDWARD LENNARD-JONES, professor of theoretical physics in the University of Bristol, has been elected to the John Humphrey Plummer professorship of inorganic chemistry at the University of Cambridge.

DR. LESLIE A. WHITE has been promoted to an associate professorship of anthropology in the University of Michigan.

DR. R. H. KAMPMEIER, instructor in medicine at the Medical School of the University of Michigan, has been appointed assistant professor of medicine at the Medical Center of the Louisiana State University.

DR. FLORENCE B. SEIBERT, of the Sprague Memorial Institute of the University of Chicago, has become assistant professor of biochemistry at the Henry Phipps Institute of the University of Pennsylvania.

DR. RUTH I. WALKER, of the department of biology of the University of Wisconsin Extension Center in Milwaukee, has been promoted to an assistant professorship of botany, and Dr. Joseph G. Baier has been appointed instructor in zoology. Dr. Walker will be acting chairman and Dr. Baier will have charge of the courses in zoology during the absence of Dr. D. C. Boughton, whose leave of absence has been extended so that he may continue his research on coccidia as a National Research Council fellow at the Johns Hopkins University.

RECENT appointments of graduates of the department of zoology of the University of California are: Blondell Carleton, teaching fellow, University of Rochester Medical School; Lloyd G. Ingles, associate professor of zoology, State Teachers College, Chico, California; Dr. James L. Leitch, associate professor of biology, Armstrong Junior College, Berkeley, California; Dr. Everett E. Lund, adjunct professor of biology, American University of Beirut, Syria; Dr. Ronald F. MacLennan, instructor, Washington State College, Pullman, Washington; Dr. R. I. Pencharz, research assistant, Rockefeller Institute; Dr. Owen L. Williams, assistant professor of biology, College of the Pacific, and Dr. Paul Thomas Wilson, professor of zoology, Marin Junior College, Kentfield, California.

DR. HARRY STOLL MUSTARD, assistant state commissioner of health for Tennessee, will take charge of the new public health district to be established in Baltimore.

A PENSION of £540 a year has been granted to Sir Joseph Larmor on his retirement from the Lucasian professorship of mathematics.

BECAUSE of ill health, F. E. Hamer has relinquished the editorship of *Chemical Age,* London, and placed himself on the retired list of Benn Brothers, Limited. He is to retain his position on the board of the company and remain a director at the unanimous wish of all his colleagues. Mr. Hamer was for many years the London correspondent of the news edition of *Industrial and Engineering Chemistry.*

DR. AUGUST KOPFF, professor of theoretical astronomy at the University of Berlin, reached New York on August 19. Dr. Kopff is a delegate from Germany to the meeting of the International Astronomical Union, which opens at Harvard University on September 2.

DR. WILLIAM BEEBE, of the New York Zoological Society, has returned from a month's reconnaissance of the shore fish fauna of some of the lesser known West Indies, such as Saba, Barbuda, Union and Mayero. The trip was made through the kindness of Colonel Edwin M. Chance on the yacht *Antares.* On August 13 Dr. Beebe left for Bermuda on the fifteenth expedition of the Tropical Research Department of the New York Zoological Society, together with his staff, Tee-Van, Hollister and Crane. Three months will be spent at the Bermuda Biological Station and on Nonsuch. In September an attempt will be made by Dr. Beebe and Mr. Barton in their bathysphere to reach a depth of half a mile.

PROFESSOR EVERETT F. PHILLIPS, of the department of apiculture at Cornell University, returned in July from a visit to Soviet Russia. He was invited by the Russian Government as a consultant on bee culture.

DR. T. C. JUNCKER, professor of botany at DePauw University, has sailed for Honolulu where he is to spend a year collecting in the Hawaiian Islands in the preparation of a revision of the Piperaceae of that area.

AN advisory board of five experts has been constituted by the Reconstruction Finance Corporation to aid in its work of facilitating and at the same time safeguarding loans for self-liquidating construction projects. The members of the board are: Dr. Charles David Marx, professor emeritus of civil engineering at Leland Stanford University, *chairman;* John Herbert Gregory, professor of civil and sanitary engineer-

ing at the Johns Hopkins University, Baltimore; John Francis Coleman, senior partner of the John F. Coleman Engineering Company, New Orleans; John Lyle Harrington, consulting engineer, Kansas City, and Major General Lytle Brown, Chief of Engineers, United States Army.

PROFESSOR ARCHIBALD V. HILL will deliver the inaugural address before the International Congress of Physiology, which opens at Rome on August 29. The subject of the address will be "Energy Exchanges in Muscle and Nerve."

THE eleventh annual scientific session of the American Congress of Physical Therapy will be held in New York City at the Hotel New Yorker from September 5 to 10. Scientific papers and symposia will be presented on September 6, 7, 8, and 9, and on the last day clinics will be conducted in fifteen New York hospitals.

THE third International Congress of Cytology will be held at the University of Cambridge in 1933.

THE second International Congress of Tropical Medicine, which was to have been held at Amsterdam next September, has been indefinitely postponed, owing to the present financial conditions.

ARTHUR HAWLEY SCRIBNER, president of the publishing house of Charles Scribner's Sons, who died at Mount Kisco, N. Y., on July 3, left $150,000 to Princeton University. The gift is payable upon the death of Mrs. Scribner.

CLEVELAND COLLEGE, which was originally made possible by a gift of $25,000 from the late Ellen Browning Scripps, has received by her will a trust fund of $50,000. The Museum of Natural History at Cleveland also receives a bequest of $50,000.

ACCORDING to the Canadian Press, Mrs. Jessie Dunlap has given to the University of Toronto a large telescope, which it is estimated will cost $500,000, for the David Dunlap Observatory, to be erected in memory of her husband. Construction will start at once on the two main buildings. On a circular platform 800 feet above sea level a round building 61 feet in diameter will be built to house the telescope, nearly all parts of which are being made in England. Larger than the one in the Dominion Government Observatory, Victoria, B. C., the telescope will be of the reflecting type and will have a mirror weighing 5,000 pounds. The telescope building and an administration building to be erected at a cost of $125,000 will be located in the center of a 177-acre plot, which will be known as the David Dunlap Park.

MR. SAMUEL A. COURTAULD, chairman of the Middlesex Hospital Medical School, London, has given £10,000 to increase the endowment of the S. A. Courtauld Institute of Biochemistry. This brings the total amount of his benefactions to the Medical School to £100,000. Its purpose is to stabilize the income of the school and its research departments, so that any economies required at the present time shall interfere as little as possible with the progress of the scientific work carried out at the hospital.

THE International Congress of the Prehistoric and Protohistoric Sciences, which met in London the first week in August, before its adjournment adopted a number of resolutions. It was proposed to organize research committees to clear up the relations between the Aegean world and the Balkan and Danubian countries; and to study the civilization of the western Mediterranean. The composition of an international vocabulary of technical terms was entrusted to Professor Childe, of Edinburgh, with the cooperation of all countries represented in the congress, and the organizing committee of the next congress was invited to see whether it was possible to present a brief report on the systems of classification adopted by different schools of archeology. The principal resolution was an expression on behalf of the congress of deep regret at the attitude of the Department of Antiquities of the Egyptian Government in putting obstacles in the way of the scientific study of Egyptian prehistory. While expressing their respect for the rights of the Egyptian nation to preserve and to arrange these documents upon their origins, the congress requested the Egyptian Government to ensure that prehistoric finds were administered in a really scientific fashion, so that the collections might become and remain accessible for specialized study. They asked in particular that measures should be taken to avoid the dispersion of prehistoric finds the scientific study of which depended upon the solidarity of the material, regardless of this aspect of their scientific value. They asked finally that no obstacles should be placed in the way of their temporary examination abroad by specialists.

NATIONAL standards for all phases of the technical equipment and operation of the motion-picture industry, from the lighting and acoustics of studios to the projectors and screens of picture houses, have been requested by the Society of Motion Picture Engineers. In a letter to the American Standards Association made public by Dr. P. G. Agnew, secretary of the association, Alfred N. Goldsmith, vice-president of the Radio Corporation of America and president of the Society of Motion Picture Engineers, asks for the development of uniform national standards to avoid the danger of confusion and waste resulting

from the establishment of conflicting standards by different groups within the industry. If the request of the society is approved, a technical committee representing all branches of the industry will be organized under the procedure of the American Standards Association.

THE Federal forest research work in the Lake States region, carried on by the Lake States Forest Experiment Station of the University of Minnesota, in cooperation with the university, has been expanded by the establishment of three field laboratories, with a total of approximately 5,400 acres and located within the Chippewa and Superior National Forests. One of these laboratories is to be known as the Cutfoot Experimental Forest, situated about 24 miles from Deer River and well stocked with growing timber, mainly Norway and jack pine. The second is the Pike Bay Experimental Forest, approximately six miles from Cass Lake, and is predominantly an aspen hardwood type. The third is the Kawishiwi Experimental Forest of 2,635 acres, about thirteen miles from Ely, and representing a distinctive region, including the jack pine, black spruce and aspen types.

DISCUSSION

OBSERVATIONS WITH THE RIFE MICROSCOPE OF FILTER-PASSING FORMS OF MICROORGANISMS

RECENTLY, I reported to the staff of the Mayo Clinic the more important observations made during three days, July 5, 6 and 7, 1932, spent in Dr. Kendall's laboratory at Northwestern University Medical School, Chicago. I went there at the invitation of Drs. Kendall and Rife, to share with them their observations in a restudy of the filter-passing forms of *Eberthella typhi* as seen with an improved model of the Rife microscope. They asked me also to bring with me my cultures of the streptococcus from poliomyelitis.

I would like to repeat here that portion of my report which had to do specifically with the Rife microscope.

Owing to the novel and important character of the work, each of us verified at every step the results obtained. Microscopic examinations of suitable specimens was made as a routine by Dr. Rife with his high-power microscope, by Dr. Kendall with the oil immersion dark field, and by myself with the ordinary Zeiss microscope equipped with a 2 mm apochromatic oil immersion lens and ×10 ocular giving a magnification of about 900 diameters. Most observations with the Rife microscope were made at 8,000 diameters. In order to check the magnification, gram and safranin stained films of cultures of *Eberthella typhi*, of the streptococcus from poliomyelitis, and stained films of blood, and of the sediment of the spinal fluid from a case of acute poliomyelitis, were examined. Bacilli, streptococci, erythrocytes, polymorphonuclear leukocytes and lymphocytes were clearly seen, and in each instance were, as nearly as could be estimated, about nine times the diameter as when examined with the 2 mm oil immersion at about 900 diameters.

The following principles and methods were stated by Dr. Rife as being essential in order to visualize clearly the objects at this and higher magnifications by direct observation. Spherical aberration is reduced to the minimum and magnification greatly increased by using objectives in place of oculars. Proper visualization, especially of unstained objects, is obtained by the use of an intense beam of monochromatic polarized light created by rotating wedge-shaped quartz prisms placed between the source of light and the substage quartz condenser. Dispersion of the transmitted rays of light, as they pass upward to the eye, is prevented by passing them through a series of quartz erecting (90°) prisms. Projection of the rays of light through air is not greater than 30 mm at any point.

In my original report[1] I summarized as follows:

There can be no question of the existence of the filterable turquoise blue bodies of *Eberthella typhi* described by Kendall. They are not visible by the ordinary methods of illumination and magnification, not because they are too small, but rather, it appears, because of their peculiar non-staining hyalin structure. Their visualization under the Rife microscope is due to the ingenious methods employed rather than to excessively high magnification. Examination under the Rife microscope of specimens, containing objects visible with the ordinary microscope, leaves no doubt of the accurate visualization of objects or particulate matter by direct observation at the extremely high magnification (calculated to be 8,000 diameters) obtained with this instrument.

The findings under the Rife microscope of cocci and diplococci in filtrates of cultures of the streptococcus from poliomyelitis, and in filtrates of the viruses of poliomyelitis and herpes encephalitis, not detectable by the ordinary methods of examination, and which resembled in form and size those found in the respective cultures, and the absence of minute forms, suggest that the filterable, inciting agent of these diseases is not necessarily extremely small, as is universally believed. Indeed, the filterable, inciting agent may be the non-staining, highly plastic, hyalin

[1] Proc. Staff Meeting Mayo Clinic, 7: 408–413 (July 13), 1932.

stage of the visible, stainable, cultivable organism, the streptococcus.

It is, of course, possible that these unstained, invisible forms revealed by ordinary methods of examination are not the inciting agents or "viruses" of these diseases and that they represent merely the filterable or other state of the streptococcus. A consideration of the great difficulty one has in isolating the streptococcus and demonstrating diplococci in lesions in these diseases and the ease with which the bodies are found in the filtrate indicate clearly that the "invisible" forms of the streptococcus, if such they be, are present in large numbers in the host, as in positive cultures of the streptococcus. Their form, size and color are too characteristic and true to type to permit considering them as artifacts or as being expressive of etiologically unrelated, contaminating streptococci. Non-infectivity of the filter-passing forms, except in the cases of virus diseases, their presence in large numbers in filtrates, both of cultures and of infected tissues, and the great difficulty in obtaining the visible forms in cultures of filtrates indicate that "invisible," filter-passing forms represent a certain stage in the development of microorganisms.

EDWARD C. ROSENOW

ROCHESTER, MINNESOTA

ON THE TAXONOMIC POSITION OF ECHINORHYNCHUS SAGITTIFER LINTON

WHILE working over a collection of acanthocephala from fishes of the Woods Hole region I have found it necessary to pay attention to changes in nomenclature which have been made since my earlier papers were published, at which time it was still customary to refer all species of the group to the genus Echinorhynchus.

Van Cleave in 1923[1] created the name Serrasentis for the genus in which *E. sagittifer,* in the following year, was included as a distinctive species. In 1924[2] he gives the synonymy of the genus Serrasentis, and *E. sagittifer* Lt., 1889, is placed as synonym under *Serrasentis socialis* (Leidy, 1881).

Leidy's description of *E. socialis*[3] is:

> Body white, cylindrical, with a dilation of the anterior fifth: narrowed posteriorly, with a white spiral band passing around the whole length and giving the appearance of transverse annulations.
>
> Proboscis moderately long, cylindrical, with twenty-six transverse rows of simple re-curved hooklets, sixteen in each row.
>
> Male furnished with a posterior vesicular appendage.
>
> Length from ½ an inch to 2 inches 4 lines: breadth of larger individuals anteriorly ⅔ of a line; posteriorly ⅔ of a line.
>
> *Habitation.*—Found frequently in considerable numbers in the intestine of *Platessa plana.*

An error has been made by some one in copying the first paragraph of Leidy's description of *E. socialis,* which in Van Cleave's paper (*l.c.,* p. 327) reads:

> Body white, cylindrical, with a dilatation of the anterior fifth; narrowed posteriorly, with spiral (white) band passing around the whole length, and giving the appearance of transverse rows of simple recurved hooklets, sixteen in each row.

With the exception of the "white spiral band," which may be accounted for without attributing to it specific value, the above description fits the species which has been recorded under the name *E. acus,* now known as *E. gadi,* found in many species of fish in the Woods Hole region, and frequently occurring in considerable numbers in *Pseudopleuronectes americanus,* a synonym of *Platessa plana.*

The proboscis of *E. sagittifer* in the original description of the species[4] is thus characterized:

> The proboscis is clavate, bluntly rounded in front, increasing slightly for a short distance back, and then narrowing gradually to the base, thickly beset with recurved hooks, of which there are about twenty series, counting from base to apex, and about fifteen visible in the longest spiral.

Leidy makes no mention of spines on the body of *E. socialis,* while they are a conspicuous characteristic of *E. sagittifer.*

Furthermore, *E. sagittifer* in the Woods Hole region has been found but sparingly, and then only in immature forms, encysted on the viscera and peritoneum of its hosts. It has been found in the adult stage only in the southern host *Rachycentron canadus*[5].

In 1884 when I was beginning work on the helminth parasites of fishes I wrote to Joseph Leidy enclosing a sketch of an acanthocephalan, which I later described under the name *E. sagittifer.* He replied that he was unacquainted with this form.

I conclude, therefore, that *E. socialis* Leidy should be regarded as a synonym of *E. gadi* and that *E. sagittifer* Linton belongs properly in Van Cleave's genus Serrasentis and should be written *Serrasentis sagittifer* (Linton).

EDWIN LINTON

ZOOLOGICAL LABORATORY,
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[1] Trans. Am. Mic. Soc., 42: 186.
[2] Proc. Acad. Nat. Sci. of Phila., 76: 325–328.
[3] Proc. Acad. Nat. Sci. of Phila., 5: 156, and Smithsonian Mis. Col., 46: 46.
[4] Report U. S. Fish Com. for 1886, p. 494.
[5] Bull. U. S. Bureau of Fish., 24: 371.

DERMATITIS PRODUCED BY PHACELIA (HYDROPHYLLACEAE)

IN March of this year, on returning from a botanical trip to the Colorado Desert of California, I developed a severe case of dermatitis on the face, hands and arms, with the usual symptoms produced by "poison oak" (*Rhus diversiloba* T. and G.), although no Rhus grew in the region in which I had been working. The disturbance lasted for about ten days. I had had the same sort of experience before and determined to attempt to learn the cause. For several days my hands were stained with a heavy brown material that had come from pressing a series of specimens of a very glandular plant (*Phacelia pedicellata* Gray) and naturally this species became suspect. On my next trip to the desert I rubbed a bit of it on one of my arms and in 24 hours the area so treated turned red and began to swell and itch. I suffered quite a little annoyance for several days. I was pleased to know what had caused my trouble and determined to guard against this plant in the future.

Early in May I was again on the desert, this time in the region of Death Valley. There I collected a peculiar form of *Phacelia crenulata* Torr., carrying the plants in to camp on my left forearm. The next day the skin of this arm and of my right hand became inflamed. Now at the end of two weeks this attack is just disappearing. The fact that this second species could produce the same effect as the first one led to experimentation with several others. *Phacelia grandiflora* (Benth.) Gray, *P. minor* (Harvey) Macbr., *P. Campanularia* Gray, and *P. brachyloba* (Benth.) Gray all produced decided dermatitis when rubbed on the skin, but *P. distans* Benth., *P. tanacetifolia* Benth., and *P. ramosissima* var. *subsinuata* (Greene) Macbr. had little or no effect. The species that produced the irritation fall in at least three different sections of the genus and agree only in being viscid-glandular, while the others are but slightly glandular.

I have discussed the matter with two physicians, neither of whom was aware of any such poisonous properties in Phacelia. Several laymen with whom I have talked have had experiences similar to mine, namely, a severe dermatitis after trips into regions where they knew *Rhus diversiloba* did not exist. One physician, after such a trip, had wondered why "Rhus Tox" antigen had no remedial effect, although he usually had good results with it. I have made no careful examination of the literature, but it would seem that many cases of "poison oak" dermatitis in the West are not caused by Rhus at all, and that a field of investigation as to toxic properties, preparation of extracts, etc., is open with regard to some of our native plants, such as Phacelia spp. and other viscid Hydrophyllaceae as *Nama Parryi* Gray. Furthermore, the desirability of the present use in our "wildflower mixtures" of some of the glandular species of Phacelia, as *P. minor* and *P. Campanularia*, may well be questioned.

PHILLIP A. MUNZ

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THE UNDERGROUND WATER LEVEL AND ITS RELATION TO THE DROUGHT OF 1930

THE writer had the opportunity of collecting some data on ground water and lake levels during the past few years. The results of these observations have given definite information concerning the fluctuations of the ground water level, as a result of the drought of 1930.

In 1929, the annual rainfall at the Ohio Experiment Station located at Wooster, Ohio, was 44.35 inches, 5.25 inches more than normal, which for the period of 41 years is 39.10 inches. During that year, every month except March, August, September and October were well above the average. In January of 1930, the rainfall was 5.33 inches, 2.19 inches above the average, which is 3.14 inches. From February, 1930, to April, 1931, there was not a single month which had normal rainfall; all were well below the average and some below half of what it should be. From April, 1931, the rainfall for the balance of the year was somewhat above normal. As far as the rainfall deficiency is concerned, the drought began in February, 1930, and ended in April, 1931. The writer had occasion, in connection with another problem, to measure the height of the water in a well at Wooster. In 1929, the water stood at a point 13.5 feet from the top. During the summer of 1930, a time of extreme drought, the water level, as indicated by the depth to the water surface, was 17 feet. During the later part of the summer and early fall of 1931, the water surface was 19 feet from the top. In May, 1932, the water level was still below what it was in 1929.

The writer questioned a number of farmers in the vicinity of Wooster and Orrville, Ohio, concerning the water supply during the years 1929, 1930 and 1931. In every case the opinion, based on observation, was that the water supply from streams, wells and springs was smaller during the summer and early fall of 1931 than at the height of the drought during the summer and fall of 1930. All gave testimony that springs and creeks were still flowing and wells had enough water for all purposes in the summer and fall of 1930. Investigations by the writer made in the course of field trips resulted in the same conclusion. During the winter of 1930–1931, wells began to go dry, and during the summer and early fall of 1931 the creeks dried up and springs disappeared. An interesting case was brought to the attention of the writer of an artesian well, 55 feet deep, which flowed

normally until about the middle of the summer of 1930. Its flow gradually slowed up until it finally stopped in September, 1931. During the fall of 1931, a new well was drilled, 100 feet deep. The initial flow was .44 gallons per minute, which increased to 4 gallons per minute by March, 1932.

Lake levels in Ohio furnish us with another body of facts concerning the fluctuations of the ground water level during 1930 and 1931. Not far from Loudonville, Ohio, are located several lakes. Careful investigation was made of the levels of these lakes from 1929 to 1932. All observations indicate that the lake levels were lowest during October and November of 1931. One of these lakes, Round Lake, overflowed through its outlet in 1929. In January, 1931, a stake was placed to indicate the water level. On November 10, 1931, the level had fallen 20 inches below the stake. On February 27, 1932, the surface was still 8 inches below the stake. The three largest lakes in Ohio, Buckeye, St. Marys and Indian Lakes, all show the lowest water level in the late summer and fall of 1931. The level of St. Marys Lake fell steadily from April, 1930, reaching its lowest points in September, October and November, 1931; the lowest point recorded was in September, 1931. Buckeye Lake fell to its lowest level in November of the same year.

The evidence is conclusive that the ground water level was lower during the summer and fall of 1931 than at the peak of the drought in the summer, fall and winter of 1930–1931. The ground water level sank steadily from April, 1930, until the fall of 1931. The facts indicate that, although the rainfall was normal from April, 1931, on, the ground water level did not stop its downward movement until seven months later, during the later part of November and December, 1931, when it started to rise gradually. It is evident that a series of rains may have no immediate effect on the ground water level, although temporarily the run-off may cause the streams to flow vigorously.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW TECHNIQUE FOR THE PREPARATION OF VITAMIN A-FREE CASEIN[1]

THE basal diet for vitamin A experiments has been investigated extensively. Sherman and Smith[2] have discussed fully the common method used in basal diet preparation in their book "The Vitamins." The vitamin A-free diet used in the Sherman laboratories is as follows:

	Per cent.
Casein vitamin A-free	18
Salt mixture, Osborne and Mendel	4
Dried brewers' yeast	10
Sodium chloride	1
Cornstarch	67

It includes also a satisfactory source of vitamin D.

This diet was used for the vitamin A experiments in the author's laboratory during 1930–31, the casein being rendered free of vitamin A by the alcohol extraction method.[1] This method involves a long tedious process. The long time of preparation, together with the large quantities of alcohol required, makes this vitamin A-free casein very expensive.

Preliminary experiments were started early in 1931 in an attempt to develop a more economical method for preparation of vitamin A-free casein. Ground commercial casein was heated in 500 to 600 gram quantities and spread on shallow trays to a depth of one and one half inches. A temperature of 110° C. was maintained in a thermostatically controlled electric oven for seven days. The casein was stirred daily to secure better air exposure.

Since the depletion records in the preliminary study indicated that the air-heated casein was as free of vitamin A as alcohol extracted casein, all vitamin A experiments for the year of 1931 and 1932 were conducted with this air-heat-treated form in the basal vitamin A-free ration.

A summary of the depletion records of vitamin A reserves in rats shows that the air-heat-treated form of casein does not carry vitamin A. An average 44-day depletion period was required for 57 animals receiving the vitamin A basal diet in which the casein had been treated by the alcohol extraction method. The average initial weight of these rats was 42 grams with a depletion weight of 116 grams, thus showing a weekly gain of 11.8 grams. The average depletion period of 131 rats which were on the vitamin A basal ration containing the air-heat-treated casein was 34 days. The average initial weight for this group of rats was 45 grams, depletion weight 112 grams, and the average weekly gain was 9 grams. Both series of animals appeared to be equally satisfactory for vitamin A tests. The longer period required for depletion of the animals on the alcohol extracted form of casein is to be explained by a modification in the stock diet. The stock diet used in the laboratory during 1931–32 was not as rich a source of

[1] Published as Scientific Paper No. 228, College of Agriculture and Experiment Station, State College of Washington.

[2] H. C. Sherman and S. L. Smith, "The Vitamins," 2d Ed., pp. 256–258, 1931.

vitamin A as the diet employed for the stock animals which supplied the vitamin A experiments of 1930–31.

The records of the negative control animals show another favorable comparison between the two vitamin A-free basal rations. Averages of 11 rats placed after depletion on the vitamin A diet containing alcohol extracted casein show a loss of 28 grams in weight during their survival period of 22 days, or an average weekly loss of 8.9 grams. A similar study of 16 negative rats on the vitamin A diet with air-heat-treated casein shows a loss of 20 grams in their survival period of 16 days, or a weekly loss of 8.8 grams.

The Sherman-Munsell vitamin A-free basal diet has been proved by many workers to be adequate for growth when vitamins A and D are supplied. The growth records of 14 positive control rats that were fed a ration composed of 90 per cent. of the basal diet containing air-heat-treated casein, 10 per cent. butter fat, and 3 drops of viosterol weekly, gained 14 grams per week during an experimental period of 5 weeks. This excellent gain in weight of the positive animals would indicate that the casein had not been modified sufficiently by the action of heat to cause the nutritive value of the basal ration to be changed.

The matter of economy has already been mentioned. Because of the economical production of the heat-treated casein its use will naturally rest upon its being equal in vital respects to the alcohol-treated form. The above experimental data seem to establish the reliability of the air-heat-treated form of casein for the basal diet used in vitamin A studies.

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AUTOMATIC CONTROL FOR VACUUM APPARATUS

To those operating vacuum ovens with electric pumps, the need for automatic control has probably presented itself. If nothing more, the annoyance from noise due to continuous operation over long periods would be enough to suggest some means of control that would cut down the time of operation of the pump. Added to this is the economy in current consumed and the added life of the pump itself. Certainly, if a device that can cut down the time of operation to five or even ten minutes out of an hour can be installed, it is worth while, provided its original cost is not too high. Nothing within reason seems to be on the market, but a very simple and yet efficient one may be made at small cost.

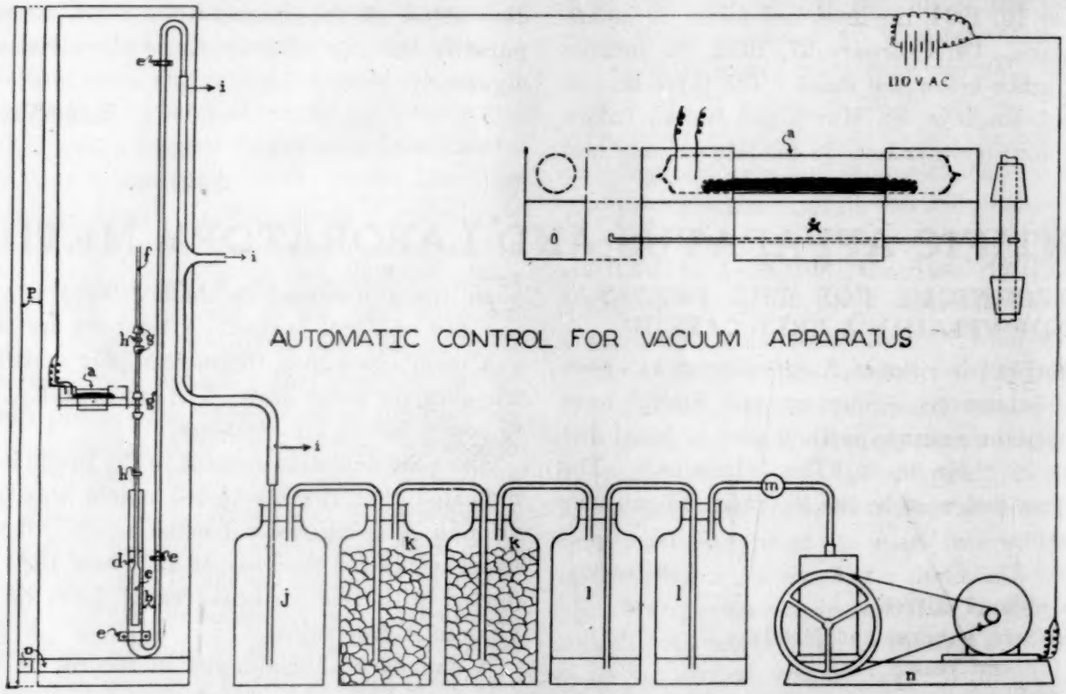

FIG. 1. p, board $\frac{7}{8}$″ x 10″ x 38″; o, shelf on p $\frac{7}{8}$″ x 1½″ x 10″; b, S-shaped glass tube; large arm, 1″ bore 12″ long, middle ½″ bore 36″ long, short arm ½″ bore 3″ long; c, glass float ¾″ dia. (outside) 3½″ long; f, stem of float ¼″ dia. (outside) 24″ long; e, clips to fasten b to board; h, ¼″ screw eyes 12″ apart; g, one hole rubber stoppers on f; a, mercury trip switch and cradle in which it rocks; x, screw fulcrum on which "a" rocks; d, mercury in glass tube; i, hose connections to glass tube, oven and moisture collecting jar; j, moisture collecting jar; k, calcium chloride jars; l, oil jars containing a little oil same as in pump; m, check valve (not needed if pump has one); n, electric pump and connections. Screw eyes "h" are to guide float and stem to prevent friction between float and tube; a few pointed papillae on the float will also prevent friction and avoid the use of the lower screw eye.

The accompanying figure will show the set-up.

Switch (a) can be bought or made. Its length should be about 3 inches. In such a switch the weight of mercury helps to operate it. If one is made, use a ½-inch glass tube and fuse platinum wires about ¼-inch apart near one end and reaching within ⅛-inch

of the opposite side. The ends of the tube can be sealed by melting or with wax. Enough mercury should be inserted to barely make contact when switch is in a level position. Nitrogen gas inserted into the tube with the mercury will prevent oxidation.

The cradle is made of a piece of sheet copper cut and bent and suspended on screw x, which acts as a fulcrum. A wire hook around the stem of the float balances the switch mechanism.

When the arrangement has been completed and the current turned on, allow the motor to run until the mercury has reached the highest point of the small part of the glass tube. The mercury will not be pumped over, if before starting the large arm was not more than two thirds full when float is submerged. At the high point there should be enough mercury left in the large arm at least to nicely suspend the float with its load of stem, stoppers and switch.

By proper adjustment of the stops g above and below the hook on the mercury switch, the high and low point of the vacuum can easily be regulated. The best arrangement seems to be to have current on at 20 inches and off at 25 inches. If all seals are good, it will take an hour or more to cause this drop, and a good pump will recover it in two or three minutes.

The stoppers above and below the upper screw eye are to prevent the float from moving over unnecessary distance, causing possible trouble to the switch. Some pains will be needed to get the arrangement balanced to do its best. The balance depends upon the weight of glass in the float, the stoppers on it, the balance of the switch mechanism and even upon the flexibility of the lead wires connecting the switch with the current cord. If the float is too light a little mercury in the float will help.

Once the outfit is properly adjusted, it becomes practically automatic.

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SPECIAL ARTICLES

PRODUCTION OF DOMINANT LETHAL GENETIC EFFECTS BY X-RADIATION OF SPERM IN HABROBRACON[1]

THE occurrence of dominant lethal genetic effects, following x-radiation, was first demonstrated in 1927 among the offspring of x-rayed males of Drosophila by H. J. Muller,[2] who states: "It was also possible to obtain evidence in these experiments for the first time of the occurrence of dominant lethal genetic changes, both in the X and in the other chromosomes. Since the zygotes receiving these never developed to maturity, such lethals could not be detected individually, but their number was so great that through egg counts and effects on the sex ratio evidence could be obtained of them *en masse*. It was found that their numbers are of the same order of magnitude as those of the recessive lethals. The 'partial sterility' of treated males is, to an appreciable extent at least, caused by these dominant lethals."

An immediate connection between the dominant lethal genetic effect and decrease in number of offspring, uncomplicated by lethal action of the rays upon the sperm themselves, would be difficult to establish in Drosophila or in any other organism in which biparental inheritance is the rule. In the parasitic wasp, *Habrobracon juglandis* (Ashmead), however, the males ordinarily develop from unfertilized eggs, only a small percentage of males in certain crosses exhibiting biparental inheritance. For this reason, if sperm were injured so that they were incapable of fertilizing eggs, x-radiation of males might be expected to cut down number of daughters, but there should be a compensating increase in number of male offspring, "step-sons" of the treated males.

During the course of investigations of the effects of x-rays on the ratio of male biparentalism, wild type (stock 1) adult males were treated with x-rays,[3] and mated on the next day and every fourth day following to recessive, orange (eyes) defective (r_4 vein) virgin females (stock 3), until each male had been mated to four females. Brothers of the treated group were mated with sisters of the mates of the treated males as controls. The first three matings of each male were observed, but in the case of the fourth, only about one half of the matings were actually observed in either controls or treated, the males in the other cases being allowed to remain with the females overnight.

As was to be expected, the proportion of biparentals among the offspring in bisexual fraternities was significantly lowered in the progeny of the x-rayed males, being 24.3 per cent., as compared with 64.8 per cent. among the progeny of controls. The mean number of offspring per female per vial is found to be $9.64 \pm .2077$ for the controls, and $6.16 \pm .122$ for the treated. The difference is $3.48 \pm .241$.

[1] The present investigation has been aided by a grant for apparatus and technical assistance to Dr. P. W. Whiting from the Committee on Effects of Radiation on Living Organisms (National Research Council). The author is indebted to Dr. Whiting for his constant interest and generous advice and direction.

[2] H. J. Muller, "Artificial Transmutation of the Gene," SCIENCE, lxvi: 1699, 84–87, 1927.

[3] Dosage, 2,500 R units; conditions, 50 KV, 8 milliamps., ½ mm Al shield, 15 cm distance from target; time, 25 minutes.

The above data take into account only the bisexual fraternities. In addition to these, 1,111 sisterless males were produced by 48 females which had been paired with x-rayed males. The mean number of progeny per female per vial for this group is 4.94 ± .1777. Since the matings of these females had been observed just as carefully as those of the controls (which produced practically no unisexual fraternities), and since the mean number of progeny per female per vial for this group is significantly lower than that of either group of bisexual fraternities, whereas unisexual fraternities regularly include much larger numbers of individuals than do bisexual, we are justified in concluding that the absence of biparentals is not due to the lack of viable sperm, but rather to the presence of sperm capable of fertilizing the eggs and of preventing development. These "unisexual" fraternities thus are not comparable with unisexual fraternities from unmated females. They are initially bisexual, from which all the biparentals have been culled by the lethal effects of the sperm in fertilization.

These data show clearly that we have to do, not with lethal action of x-rays on gametes, but with a true zygotic dominant lethal effect.

Certain data reported by Raymond J. Greb[4] tend to corroborate the conclusion reached from the above findings. While investigating the effects of x-radiation of mated females upon the rate of production of mosaic males in Habrobracon, Greb found that the number of sons per mother (in bisexual fraternities) was reduced slightly in the group of treated mated females, but that the percentage of females among the offspring was reduced significantly (20.8 per cent.) and that the total number of offspring per mother was also significantly lowered (37.32 per cent.). The points to be noted here are: first, that while the number of females was considerably lowered among the progeny of treated, the number of males produced did not increase to the extent of preserving the same average number of progeny per mother as that for the controls; and, second, that although this lowering of the general fecundity among the treated may not stand alone as conclusive evidence for the production of dominant lethals (because of the uncertainty as to the extent to which the direct effects of x-radiation on the eggs contributed to this diminished fecundity), they are in accord with the results obtained from the investigation in which the males alone were x-rayed.

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[4] Raymond J. Greb, "Effects of X-radiation on Production of Mosaic Males and on Sex Ratio in Habrobracon." In press.

A NOTE ON ELECTRICAL POTENTIAL AND THE PHYSIOLOGICAL GRADIENT

THE known facts about physiological gradients have been experimentally discovered, chiefly, as with Child's Planaria, by the study of teratological forms produced by subjecting the growing plant or animal to a differential of environment. This differential has usually been determined chemically, electrically or by the action of heat or of light. The electric current or potential has been found as yet to have three effects upon growth, namely, inhibition, reversal or retardation. The following experiment with hens' eggs was carried out as a feeler in order to indicate what might be expected in a fuller study of the effect of electrical potential on the development of the chicken embryo.

Five dozen eggs (White Leghorn) served in the experiment. Twenty-eight of these served as a control group, being hatched in the same incubator as the experimental group, but subject to no electrical potential. The remainder were divided into four groups as follows:

6 eggs with field in direction of minor axis.
8 eggs with field in direction of major axis.
9 eggs with vertical field—positive above.
9 eggs with vertical field—negative above.

These eggs during the period of incubation were set between metal plates carrying a steady potential difference of 81 volts, which was provided by two dry batteries. The eggs were insulated from the plates by sheets of cardboard.

Twenty-one chicks were obtained from the control group at the end of twenty-two days.

The eggs in the horizontal fields were retarded about 36 hours, 10 chicks being obtained from the 15 eggs, these chicks being, as far as could be determined, quite normal.

Of those in the vertical fields none emerged, even after 28 days; but on the 23rd day these were "candled" and found to be at the stage of maturation which is normally reached on the 18th day, and one broken up was seen to be alive

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BOOKS RECEIVED

MORGAN, THOMAS H. *The Scientific Basis of Evolution.* Pp. ix + 285. 40 figures. Norton. $3.50.

SANDON, H. *The Food of Protozoa.* Pp. 187. The Egyptian University. Piastres 20.

SNIDER, LUTHER C. Earth History. Pp. xiii + 683. 333 figures. Century. $4.50.

STONE, RALPH W. *Pennsylvania Caves.* Pp. 143. 67 figures. Topographic and Geologic Survey, Harrisburg.